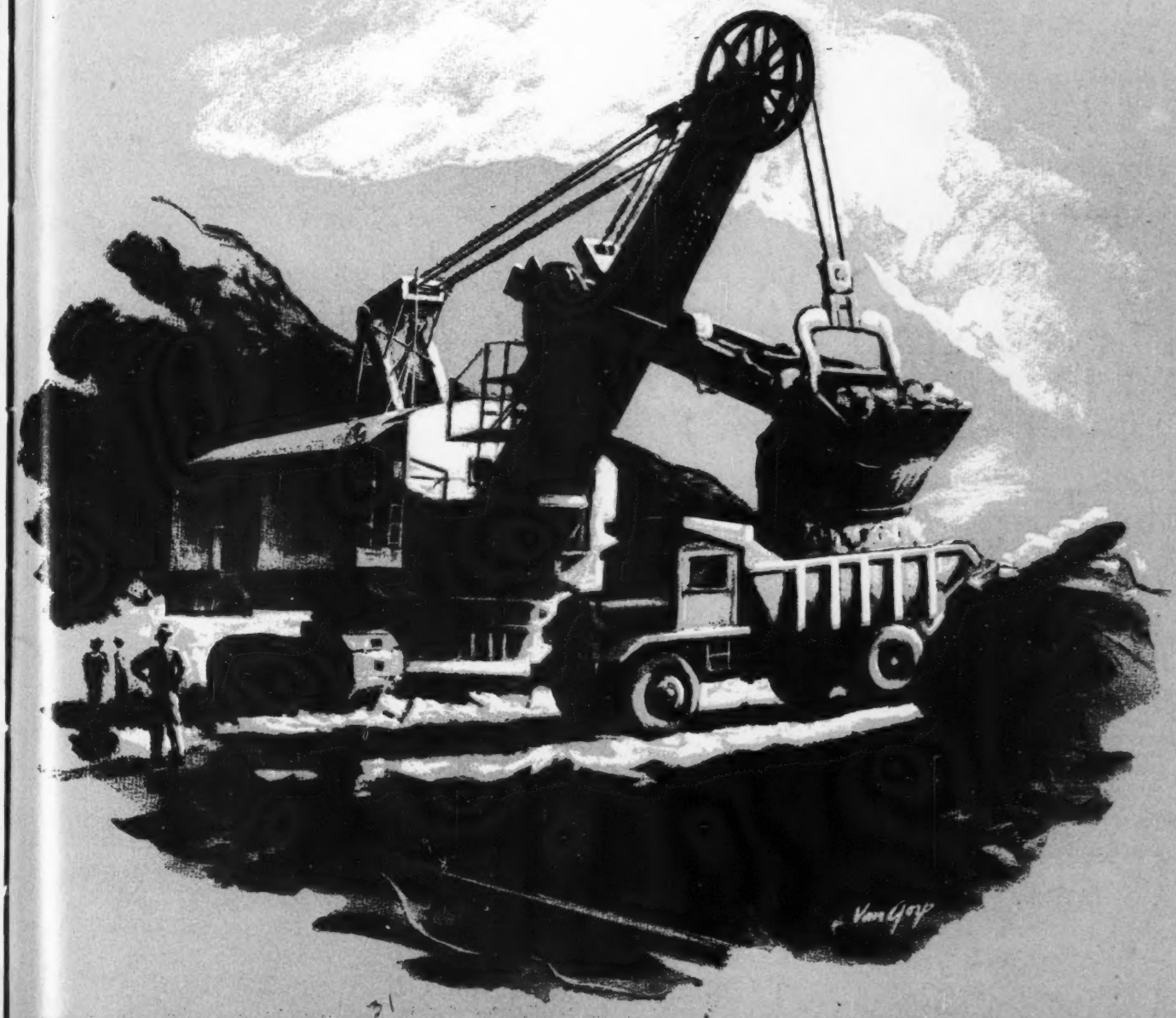
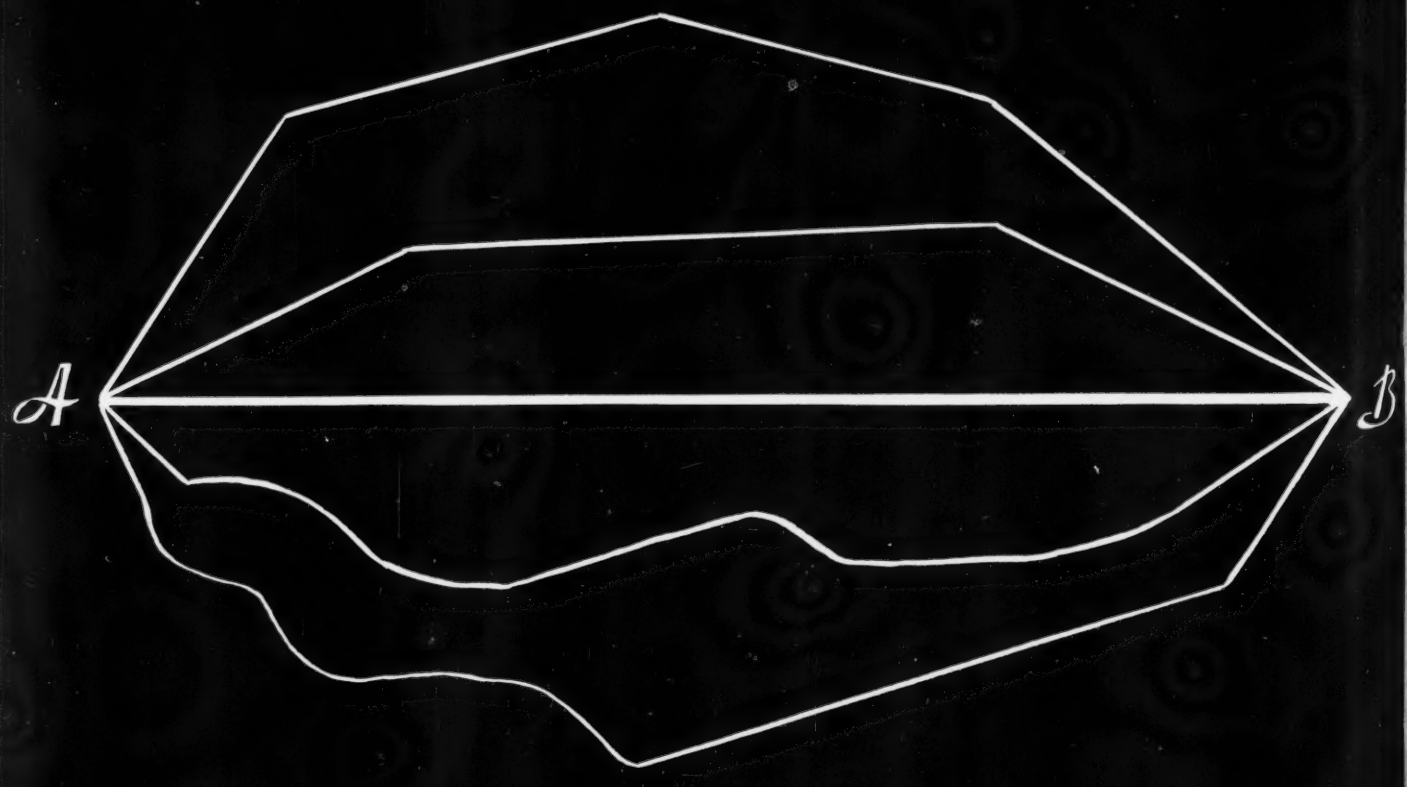
ENGINEERING AND MINING JOURNAL

February, 1944



Postwar Outlook for Metals



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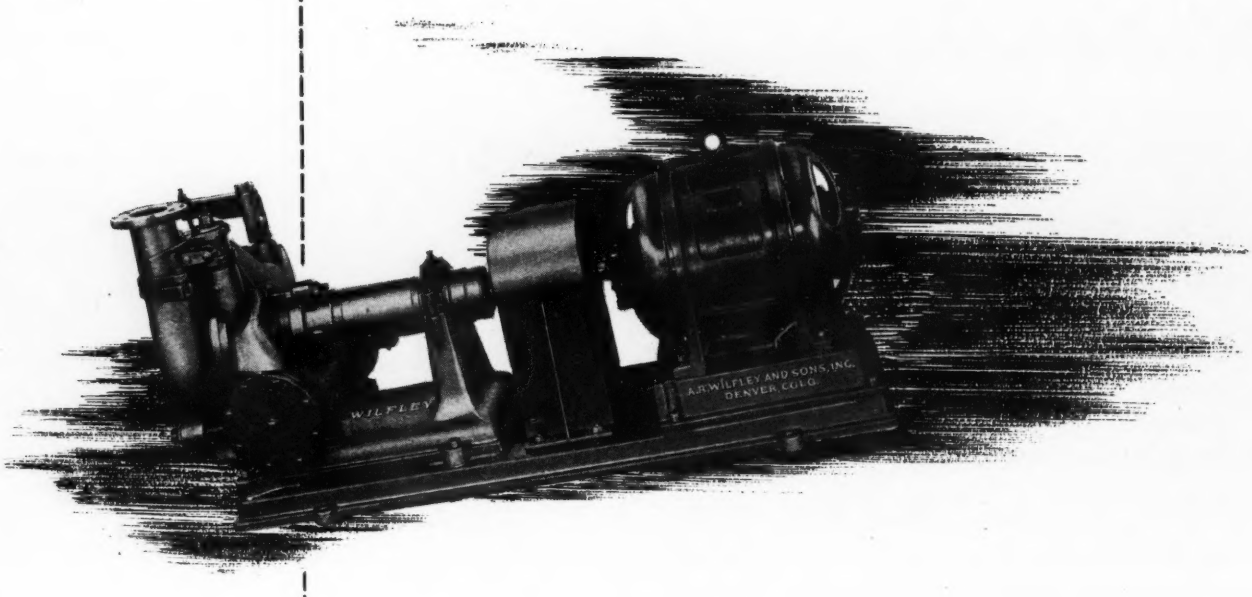

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H. C. Parmelee, Editor

Wanted—A Mineral Policy

THE OWNER of a marginal mine—that is, one which depends on the Premium-Quota Plan for its continued operating life—is naturally in a state of great uncertainty over his future. He knows that his industry is producing surpluses of most minerals for present purposes and that in many cases imposing stockpiles have already been accumulated. Consonant with this situation, the government has announced a policy of not bringing new marginal properties into operation.

Government officials have also taken great pains to assure the operators of marginal mines that there is no present intention of cutting any of them off. But in the face of the known supply situation, how much assurance is this to such operators? They know that the government will not subsidize mineral production *ad infinitum*, probably not beyond the point necessary to insure adequate war supplies. Under present circumstances they can only presume that they are living on borrowed time, the government being willing to let surpluses accumulate at the present rate until it becomes evident how fast the assault on Germany's western flank will chew up materials.

Under these circumstances the operators who entertain no hope of carrying on in peacetime, and who have no assurance that they will not be cut off on thirty days' notice at some indeterminate time in the near future, are likely to resort to a policy of skinning their mines for all they can get out of them while the getting is good.

Such a course might have unfortunate consequences. If the war should drag out to the point where production from these mines will be required, to rob them and curtail development will hamper future capacity and raise future costs. In some cases the mines may be wrecked.

To prevent such a possibility the remedy is simple. The government should give the mine operators assurance that for some stated period, such as for one year from date, there will be no premium reductions no matter what course the war takes. Inasmuch as invasion requirements are not likely to become known until late summer or early fall, the cost of such assurance would be small compared to the benefits in terms of insurance and morale. If such a statement would be given out once a quarter, the operator could continue to count on a year in which to undertake development and benefit from it.

The logic of such a policy will be apparent to anyone who has ever operated a mine, as nobody knows better than the practical miner the necessity of planning ahead for whatever length of time is necessary to realize production from development. The miner will appreciate that the assurance as to time is fully as important as the price-premium level if not more so.

It would also be highly desirable in the public interest if concurrently some policy could be worked out defining the government's attitude toward marginal mineral deposits. These have possible future emergency significance and may some day be economic for peaceful purposes. It would seem sensible for the government to afford the owners of marginal ore, whether in the strictly marginal mine or associated with bodies of workable ore, sufficient inducement to prevent them from destroying access to the marginal deposits.

Labor Incident in British Columbia

SCARCELY had the ink dried on our issue for last October, in which we commended the fine labor relations prevailing in Consolidated Mining & Smelting Company of Canada, before we received a letter from the local miners' union at Kimberley, B. C., telling us that our article and editorial were out of date. It transpires that early in November, after our October number was in press but before it was mailed, the International Union of Mine, Mill and Smelter Workers (CIO) won a long-standing contest for recognition as the bargaining representative for Consolidated employees at Kimberley. In so doing, the union supplanted the Workmen's Cooperative Committees, which had practically been outlawed by the Industrial Conciliation and Arbitration Act of British Columbia. In the first flush of success the union claimed a victory at Trail as well as at Kimberley, but it now appears that it could not muster a majority of the workmen at the smelter city and

was not recognized as their bargaining representative.

The incident is worth noting for two reasons. First, in succeeding the Workmen's Cooperative Committees the CIO takes on a difficult job of representation and will have to acquit itself well to maintain, not to say improve, the labor-management relations that have prevailed in Consolidated for many years. It will be interesting to see what the Mine, Mill and Smelter Workers Union can achieve for Consolidated employees that they could not have obtained for themselves through their Cooperative Committees. Second, we think it unfortunate that the new Industrial Conciliation and Arbitration Act of British Columbia should outlaw Cooperative Committees, even as the National Labor Relations Act in the United States has been used to put so-called company unions out of business. Certainly the Cooperative Committees of Consolidated were worthy and successful instrumentalities for excellent labor-management relations, and their downfall is to be regretted. May their successors have an equally commendable career.

Can We Take Your Order for a Helicopter?

THE ECHOES of the last shot of the Second World War will hardly have died away before there will descend on the people of this country a horde of salesmen offering at ridiculously low prices a host of new products, including everything from helicopters to stoves made of transparent plastic so that Bridget can watch the cake falling in comfort. There is no end to the wonderful variety of chromium-plated, electronically controlled, light-metal gadgets that will be practically given away to us all, once we are rid of the annoying interference of the war. There is also not a word of truth in all this.

Let's stop kidding each other. When the war is over, there will be no big change in our way of doing things. We will go on hanging from our strap in the subway on the way to work just as we do now, and we will bet that the Empire State building will be worn down to a nub before the mass of New York's commuters ever rides to work in helicopters.

Furthermore, our postwar car, if we can get one, will be a 1942 model with a little chromium stuck on here and there. At least that's what Alfred P. Sloan, Jr., says, and he's one of the men we're going to buy a car from. Forget about those luscious tear-drop streamliners the artists love to draw and label "Postwar Model." You'll have a long gray beard away down to there if you stop shaving until you get a car like that. It will take long enough to get automobile production lines going again on 1942 models, let alone rebuilding them to produce some turtle-shaped speedster that might prove to be a lemon in disguise.

But don't forget, too, that if you insist on riding in helicopters and on looking at Frank Sinatra via television, as well as listening to him, you will be accommodated. The war has unquestionably accelerated the rate of development of aviation and radio, and the general public will be the eventual beneficiary. David Sarnoff, president of RCA, says, "The new ideas, tools, and instruments that emerge from the war may well give us a 1960 radio in 1950." Remember that statement the next time you read about a Golden Age to be handed you on a plastic platter immediately after the war. Sarnoff said "may well." Also, he said "1950."

Oh, Brave New World

POSTWAR PLANNING has reached its peak, as far as we're concerned, with a snappy forecast just rushed to our desk by an emissary of Corrigan, Osburne & Wells, Inc., management consultants. R. H. Wells, president of that firm, claims responsibility for the opus, and says modestly that it is all done by "intelligent exercise of the imagination."

"Getting Down to Earth on Post War Work" is what he calls it, but after planting his feet thus firmly on the ground, Mr. Wells zooms lightly off into the future, and before you can say "Henry Agard Wallace" he is back with the cold dope on everything up to 1970.

Brother, what's going to happen to us shouldn't happen to a dog. First of all, you-know-who is all set for another term, so don't get your hopes up; but, says Wells, the fourth time is the last time. Then, just as the poor Republicans have got their feet tucked under the table in 1948, bang, down we go into a depression.

But wait! Two years in the pit and then, whee! Up we come in a soaring boom that will grow and grow and grow until 1960, when the whole thing will burst in our faces, millions will be unemployed, Russia will absorb Finland, and, says Wells, "Germany again rocks the boat." Having successfully plunged the world into depression and given Finland to Russia, Mr. Wells stalks off, curling his moustache, while we all prepare as best we can to fight the Third World War.

Do you want a piece of that brave new world? Neither do we. But what we have to do to avoid getting it is to join with the citizens of the rest of the world and refuse to buy a ticket on the roller coaster ride foreseen by Mr. Wells. We must level out the booms, fill in the depressions, forego the luxury of the Third World War. We must do these things because the only alternative is the collapse of civilization into a darkness so black not even the bold Mr. Wells can pierce it.

New War Production Board Organization Recognizes Importance of Minerals

WITH THE APPOINTMENT of a Vice Chairman for Metals and Minerals, with full charge of all activities affecting the mining industry, the War Production Board has finally created a status for mineral administration commensurate with the importance of the mining industry to the war effort.

Appointed to the new office is Arthur H. Bunker, who has been Director of the Aluminum-Magnesium Division of the W.P.B. and its forerunners since December of 1941. Under Mr. Bunker are grouped all the mineral agencies of the board, which in the past have been partly dissociated. The reorganization preserves but rearranges all the mineral branches with the exception of the Minerals Bureau, which is abolished. Its director, Howard I. Young, becomes Deputy Vice Chairman in charge of production. A second Deputy Vice Chairman, in charge of facilities and distribution, is S. W. Anderson.

ARTHUR H. BUNKER
WPB Vice Chairman for Metals and Minerals

The mineral industry can congratulate itself that the man selected to rule over some of its most vital problems is experienced in the industry, familiar with the West, and sympathetic to the industry's problems. Also, as Director of the Aluminum-Magnesium Division Mr. Bunker has proved himself to be a capable and forceful executive, unsympathetic to attempts to use the war emergency as an excuse to thrust the government into the logical field of private enterprise in industry.

Mr. Bunker is a native of Yonkers, N. Y., and a graduate in electrical engineering of Sheffield Scientific School of Yale University. After his graduation, in 1916, he enlisted in the U. S. Navy, where he became a lieutenant in naval aviation. After the war, in 1919, he went to Denver, Colo., where he resided for the following eight years. From 1919 to 1924 he was president of Radium Company of Colorado, which was engaged in development of the carnotite ores of the western part of the State. In 1924 he founded the United States Vanadium Corporation, whose operations centered around Rifle, Colo. Bunker was president of this company for three years, until it was sold to Electro Metallurgical Company, Union Carbide and Carbon affiliate, in 1927. He then moved to New York, where for the following two years he was president of the Carib Syndicate and of Colon Development Co., devoted to South America oil development, the former in Venezuela, the latter in Colombia. In 1929 Bunker became executive vice president of Lehman Corporation, a New York banking firm. In this capacity he was active in the organization of Potash Corporation of America, operating at Carlsbad, N. M. He was also a director of Anglo-Huronian, Ltd., Brooklyn - Manhattan Transit Corp., Brooklyn & Queens Transit Corp., New York Rapid Transit Corp., and Williamsburgh Power Plant Corp. When he joined the Office of Production Management in 1941, he immediately resigned from all of his private business connections.

In addressing the joint session of the American Mining Congress, Western Division, and the Colorado Mining Association, in Denver on Jan. 28, Mr. Bunker displayed a reassuring knowledge of the difficulties ahead of him in gearing the mining industry to its future war functions and peacetime adjustments, in working out a proper balance between domestic and international mineral problems, and in disengaging the government from the productive activities assumed during the war. He urged the fullest possible cooperation of all the interested parties.

Mr. Bunker has created a streamlined organization to aid him in performing his new functions in the War Production Board. This is shown in the form of a chart which appears on page 115, in Washington Reflections.

POSTWAR and PAST YEAR

EMPHASIS on the future marks this February issue of *E.&M.J.*, more so than has been customary in the Annual Survey and Outlook Number in the past. This derives from the inclusion of the following 16-page section on the Postwar Outlook for the Metals, the third installment of the Postwar series which was started in December. The remaining pages deal with recent progress scored in technical practice. The result is a view of the mining industry that takes in the changing methods of production and the possibly changing opportunities for disposing of the products. Elements composing this picture are brought together here.

THE METALS (Pages 71-86.) Gold is expected to be retained in the monetary system. Mining of gold will be affected by the trend in world prices and other cost factors. . . . **Silver's position** in the monetary field is uncertain, but peace-time use in industry is expected to expand. . . . **Copper** will hold its important markets, despite aluminum's threat of increased competition. . . . **Lead producers** look forward to increased business in pigments and to sustained activity in other lines. . . . **Zinc prospects** in galvanizing are encouraging. . . . **In fixing the tin policy**, the United States is expected to have a voice. . . . **The ferro-alloy metals** will be favorably situated. Use of nickel and chromium in stainless steel points upward. . . . **Aluminum and magnesium** seem certain to find increased use. The industries, however, look for no immediate expansion in volume approaching capacity to produce.

MINING GEOLOGY. (Page 87.) Drain on deposits of the heavier metals has been paralleled by the strain on exploration men seeking new ore, hampered by deficient manpower. New finds have been of modest size. Depleted reserves provide a problem. . . . **Controlling structures,** in ore finding, tend more and more to be emphasized, in contrast with the older mineralogic-petrographic viewpoint. . . . **Training in mineral economics,** sufficiently broad, would offer opportunities to otherwise well-trained geologists, the war emergency has shown; likewise that a good directory of mining geologists is needed. . . . **Many new reports,** now confidential, await publication.

MINING PRACTICE. (Page 90.) Miner-training programs are bearing fruit and are worth continuing. . . . **The multiple-shift problem** merits further study. . . . **Use of equipment** in new application and changes in practice are to be seen in almost every operation. Equipment is being made to do its utmost.

MINERAL DRESSING. (Page 94.) Depleted domestic sources of high-grade iron ore have focussed attention on the techniques now being devised in several research laboratories to concentrate taconite and low-grade iron ores. . . . **Heavy-density separation methods** are used ever more widely. . . . **Magnetic separation and flotation** have found new applications. . . . **Automatic instrument control** is being applied to several milling processes, and its use seems certain to increase.

IRON ORE BENEFICIATION. (Page 97.) Concentration of taconite seems to involve a choice between roasting, followed by magnetic separation, and an all-flotation process. Because minus-100-mesh grinding is necessary to release the iron-bearing minerals, the end product of both processes will have to be sintered. . . . **Low-silica iron concentrates** can now be produced by flotation of washing plant tailings, and the flotation process may enter the field as an adjunct to washing and jigging. Flotation of silica, leaving iron minerals in the tailing, may prove cheaper than the iron flotation that was first attempted.

COPPER SMELTING. (Page 98.) Improvements in practice are few, owing to pressure for production. . . . **Soda-ash treatment** in smelting lead drosses in A.S.&R. plants permits an increase in the copper-lead ratio of both speiss and matte, with attendant advantages. . . . **Hudson Bay** has improved matte handling between the reverbs and the converters; is smelting selected high-grade directly in the latter; has equipped four more roasters for preheating combustion air; and has insulated the roaster flue to save heat and to lessen corrosion. . . . **Scrap** gets increasing attention.

LEAD METALLURGY. (Page 99.) Having begun to treat residues from zinc plants, some lead smelters are finding furnace operations increasingly complicated. . . . **Certain smelters** are using scrap iron to take care of zinc. . . . **More lime** is used in blast furnace charges. . . . **Dwight-Lloyd practice** has been improved. . . . **Copper-bearing lead bullion** is being made to yield dross high in copper. . . . **In debismuthizing lead** more magnesium is likely to be used with calcium.

ZINC METALLURGY. (Page 101.) Heavy-density processes have helped increase zinc output during the year. . . . **Fuming** lead-blast furnace slags is now being used to recover zinc in two plants. . . . **Recovery of cadmium and lead** from zinc concentrates by sintering with salt on Dwight-Lloyd machines is being tried. . . . **Flash roasting** is now used wherever possible. . . . **Reflux fractionating** is being employed to refine lower grades of die-cast munitions and cartridge brass.

FERRO-ALLOY METALS TECHNOLOGY. (Page 103.) Use of special alloy steels for war purposes has expanded enormously, and suppliers of ferro-alloy metals have been hard put to it to satisfy the demand. . . . **In treating low-grade ores,** research problems have arisen and have been solved. . . . **Boron** has gained a secure place in alloy-steel manufacture. . . . **Cobalt** is being recovered by flotation and chemical treatment. . . . **Use of electrolytic manganese** is spreading. . . . **Nicaro Nickel Co.** has completed its Cuban plant. . . . **Molybdenum and vanadium** metallurgy have been improved.

ELECTROMETALLURGY. (Page 107.) Aluminum and magnesium capacity was expanded so enormously in 1943 that the problem has become one of disposal rather than supply. Production of both metals has been cut back, aluminum more sharply. . . . **Power** available to electrolytic plants likewise was increased amply in 1943, but manpower shortages caused difficulty, particularly in West Coast plants. . . . **Electrolytic tin-plate** production will be still further increased.

POSTWAR OUTLOOK for MINING

Prospective Uses for Metals Are Promising BUT Market Competition Will Be Keen

PART THREE **Wartime developments have made it obvious that the postwar years will witness a struggle for markets for metals and alloys such as the prewar era never knew. The reasons vary: In instances, the coming competition can be ascribed to experiences arising from shortage of materials customarily available. Designers, forced to accept substitutes, have made the best of them, sometimes with unexpectedly good results. Again, the plenitude of such metals as aluminum and magnesium calls for new industrial outlets. Gold is in a separate category.**

A 16-PAGE SECTION ON THE FUTURE OF THE NON-FERROUS METALS

The Precious Metals

GOLD

The monetary system is likely to retain it

ANNOUNCEMENT of plans by the British and American treasuries for setting up new international monetary and banking institutions after the war has intensified speculation concerning the future role of gold as a monetary metal. The proposals themselves envisage the retention of gold as a medium for the settlement of international balances, and some observers seem to have assumed that this removes any uncertainty concerning the future of the metal and of the industry that mines it. However, some considerations remain which should command attention. An attempt is made to discuss them in the following paragraphs with a minimum amount of digression into monetary theories.

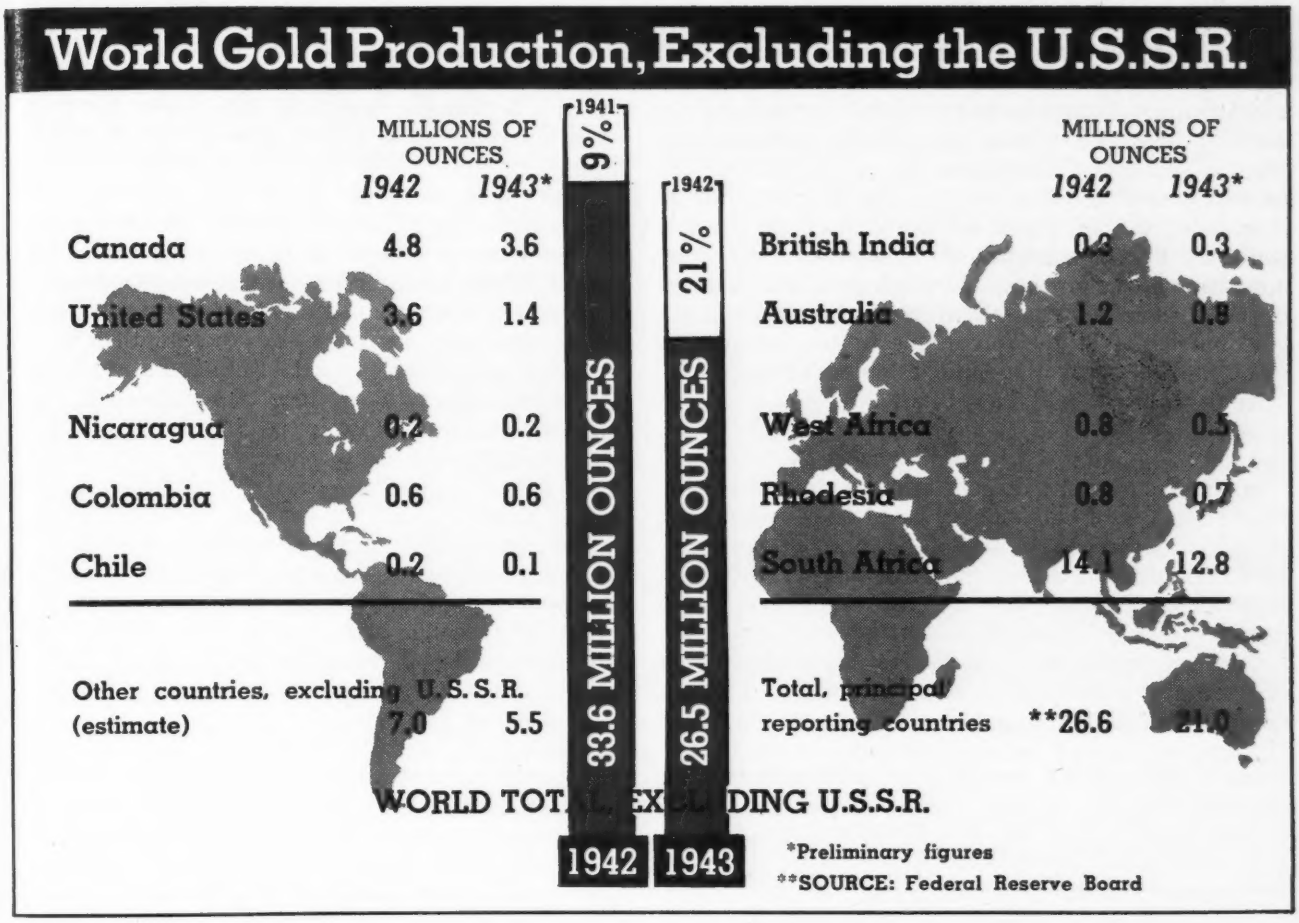
Experience during the war, when economic activity has shown many of the characteristics of an extreme boom period, has illustrated the basic fact that gold mining is essentially a "depression industry." Gold mines are almost unique among productive enterprises in that they characteristically have an unlimited market for their product at a fixed price. No more favorable position could be envisaged for an industry entering a depression period. On the other hand, in boom times—as during the war—the fixed price becomes a disadvantage, since gold mines cannot meet the rise in operating costs characteristic of such a period by increasing their selling price. Furthermore, gold mining suffers from the changed attitude of the government toward employment in the industry. As has been demonstrated during the war, in a period of labor shortage the government looks with disfavor upon the use of able-bodied men in gold mines, whereas during a period of depression the government welcomes the relief to unemployment which the mines provide.

In fact, there is a growing tendency in the United States to justify the government's policy of buying gold in unlimited quantities at a fixed price on the ground that this is a useful device for maintaining employment. Of course, the effect of this policy in keeping domestic gold miners employed is insignificant in relation to the general unemployment problem. However, purchases of gold from foreign countries—whether from new production or from reserves—make a much more effective contribution simply because of the larger scale on which such operations can be conducted. Of the net increase of 14.5 billion dollars in our monetary gold stock during 1935-41, only 1.0 billion came from domestic mines. These purchases of gold from abroad create employment in our export industries, because a large proportion of the dollars spent on such gold is used by foreign countries to buy American goods which they could not otherwise afford.

Of course, though this process does create jobs and helps alleviate the social and economic pressures arising from unemployment, the real fruit of this employment (the exported goods) is enjoyed by foreign countries. It is true that the United States receives a further addition to its gold reserves, but some question may be raised as to whether our stockpile of this metal is not now adequate for any foreseeable emergency. It may be noted that in the present crisis less than $1 billion of our $22 billion gold reserve has actually been put to use in financing the war. Suggestions are already being made that after the war the government should import and stockpile large quantities of strategic metals and other materials. Such a program offers a genuine alternative to purchases of foreign gold in the sense that it would equally well supply dollars to foreign countries and thereby stimulate employment in our export industries; and at the same time it would make a more realistic contribution to national preparedness. Suppose, however, that the available supply of foreign strategic materials proves to be insufficient to produce an adequate volume of employment in this country, or that stockpiles of such materials become as superabundant as our stockpile of gold. The further alternative would remain of public investment in roads, power development, low-cost housing, and other projects of similar nature, which would give as much employment as an equivalent amount of gold purchases, and the fruit of

Politics and Gold and Silver

The future of gold and silver as monetary metals is becoming increasingly involved in political negotiations and dependent on political action, national and international. Global war is likely to intensify, not weaken, this trend, as national isolation becomes impossible in a shrinking world and international cooperation grows in importance. This hurdle is not a new experience for silver, which has long since had to rely on political action to surmount obstacles in its path, but it is relatively new for gold.



this employment would go to raise the standard of living in the United States.

Of course the immensely attractive feature of the gold purchase program as a means of creating employment is that under our present monetary system the government can finance such expenditures without raising the funds by taxation or borrowing. As it buys gold, it pays for it simply by issuing money against it. Although the creation of money in this form is directly inflationary, it is sanctioned by long tradition, and the government naturally welcomes this "painless" method of financing employment. It would be no more and no less inflationary if the government printed money to buy imported strategic materials or to carry out other forms of public investment; however, such action would no doubt arouse widespread opposition on the ground that it represented "greenbackism."

In the light of these considerations, what may be said about the outlook for gold in this country? Is it likely that any substantial use will be found for the present stockpile of gold? If not, is it still likely that the government will continue to add to this stockpile by buying all new gold offered to it from domestic and foreign sources? If it does continue to buy, will it continue to offer the present price or may the price be changed upward or downward? And what can be said of the outlook for gold-mining profits?

Basically, a reduction in the present volume of our gold reserves may be anticipated only if our balance of payments with foreign countries undergoes a fundamental readjustment so that we tend to buy abroad more than we sell, meeting the resulting deficit in transactions with foreign countries by exporting gold. It is difficult to imagine such a development for many years after the war, because of the great needs for reconstruction in foreign countries. In any event, even when foreign countries are again able to cover their own requirements and to produce a surplus of goods for exportation to the United States, it appears doubtful whether we will ever accept a volume of imports substantially in excess of our exports. There is a widespread conviction in the United States that the importation of goods which can be produced here constitutes undesirable competition, and on the other hand that the development of foreign markets is a natural and welcome outlet for our energies. Even if a marked change in this sentiment should occur, and if the idea should spread that exports are only really productive to the extent that they enable the American public to enjoy the benefit of cheap imported goods, the chances of an actual reversal in our balance of trade to the point where gold exports would be called for seem very slight. This will be true if only because few foreign countries are able to afford the luxury of accepting payment in gold instead of in goods for any substantial part of their exports.

Despite the fact that the outlook is for a continued accumulation of gold by the United States, there are strong forces opposing any change in the policy of purchasing all gold offered. The gold-purchase program

will continue to constitute an important weapon in fighting unemployment, and at the same time will be a relatively painless and non-controversial method of assisting foreign countries to reestablish themselves on a working basis. Of course considerable pressure may arise in support of alternative devices for curing the unemployment problem, despite the ill effect which restriction of gold purchases would have on foreign countries. This pressure would first manifest itself in an opposition to the purchase of foreign gold, but the logic of the situation might also lead to criticism of domestic gold purchases. In the foreseeable future, however, it seems unlikely that the United States Treasury will cease to accept all gold offered to it.

The Price for Gold

So far as the price of gold is concerned, this is of course a matter of public policy based on considerations completely divorced from the position of the gold-mining industry. These considerations arise from questions of domestic policy (*i.e.*, the valuation of gold reserves in the banking system) and from questions of foreign policy (*i.e.*, the level of exchange rates between the dollar and foreign currencies). On the domestic side, it is conceivable that monetary inflation (increase in currency and bank deposits) in the United States might proceed at such a pace that the existing gold reserves taken at their present dollar value would be inadequate to meet the present legal reserve requirements of the Federal Reserve Banks. Under these circumstances, it might be proposed that the price of gold be increased to mark up the dollar value of these reserves. However, this would be a transparent piece of monetary juggling, and, in the absence of some pressing consideration of external policy, probably the more realistic attitude would be adopted of reducing the legal gold reserve requirements of the banking system. On the other hand, a reduction in the price of gold is rendered the more unlikely because it would involve a reduction in the dollar value of the gold reserves of the banking system.

Questions of external policy, therefore, will probably be decisive in determining any change in the dollar price of gold. An increase in our buying price for the metal would be undertaken only if it were desired to depreciate the dollar vis-a-vis foreign currencies, a result which would naturally follow so long as gold remains the standard medium for international payments and the yardstick of value for national currencies. However, a depreciation of the dollar in the exchange markets, which would make American exports cheaper in foreign countries and our imports more expensive, would be desirable only if it were necessary to enable the United States to avoid a deficit in its balance of international payments. At the moment this is a remote contingency; under present circumstances, our problem is generally considered to be how to escape too large a surplus of exports and too large a drain upon foreign gold. The only possible set of circumstances in which a further devaluation of the dollar might be justified would be a sharp rise in the price level in the United States *not* matched by a corresponding rise in prices abroad. Such a development might so seriously affect our competitive power in world markets as to make necessary a downward adjustment of the international value of the dollar. This conclusion would not hold, of course, if the rise in prices were world-wide.

Lest it be thought that we might devalue the dollar, not to correct a deficit in our balance of payments but rather to produce a huge export surplus aimed at curing unemployment, it should be pointed out that in the latter circumstance foreign countries could and probably would adopt counter-measures to prevent us from receiving unfair competitive advantage in world markets as a result of the devalued dollar. They would simply devalue their own currencies—i.e., increase their buying prices for gold—thereby reestablishing the former pattern of exchange rates. It may be recalled that something similar to this took place in the 1930's and resulted in a world-wide increase in the price of gold. Beginning with England in 1931, followed by the United States in 1933-34, first one country and then another devalued its currency in terms of gold in an attempt to stimulate domestic recovery by obtaining export markets. In the end, however, the pre-1931 pattern of exchange rates among most of the leading currencies was largely reestablished; the pound sterling-dollar exchange rate, which was fixed at $4.86 before 1931, averaged $4.89 in 1938. The principal result of this splurge of competitive currency devaluation was that throughout the world the price of gold had been jacked up to a new high level, bringing a completely fortuitous and unintended reward to gold-mining enterprises. The new international monetary institutions which have recently been proposed by Treasury experts in the United States and England would seek to prevent a repetition of this particular kind of monetary folly. Among their principal objectives is to coordinate international monetary policies in the postwar period and to combat competitive currency depreciation.

Outlook for Mining Profits

What, then, is the outlook for profits in the American gold-mining industry, as determined by the *relative* movements in the dollar price of gold and in the level of operating costs? Again the truth is apparent that gold mining is preeminently a "depression industry." If a serious setback occurs in general business activity, a fall in the general level of prices in the United States may well occur while no reduction in the price of gold is to be expected; the profit ratio in the gold-mining industry will therefore increase. But if after the war a reasonably high level of business activity is maintained, and the wartime controls on wages and prices are removed, it is not unlikely that an upward movement of the general price level will occur. Whereas, during the last decade, gold miners profited by a sharp rise in the price of gold at the beginning of the period, only partly and belatedly offset by a rise in operating costs, the outlook for the future—if prosperous business conditions are maintained—is a rise in operating costs which may or may not eventually be offset by a new increase in the dollar price of gold. In other words, if there continues to be a measure of inflation, the gold-mining industry—continuing to have an unlimited market for its product but only at a fixed or belatedly rising price—will find its margin of profit under insistent pressure.

SILVER

Its industrial use is expected to expand

FORTUNATELY for silver, it has two strings to its economic bow—industrial and monetary. The phenomenal rise in wartime industrial use of silver is in marked contrast to ordinary peacetime conditions, and points to possible new uses for the metal in the postwar period. The best summary of the situation is contained in a pamphlet "Silver in Wartime," published by the U. S. Tariff Commission last September. From it we excerpt important statements and statistics, and commend the entire document to all who have a primary interest in silver.

Extraordinary physical and chemical properties give silver a wide range of industrial usefulness. It resists a great variety of corrosive agents. It has strong bonding power, high electrical and thermal conductivity, and remarkable optical reflectivity. It forms salts and compounds with useful photosensitive and bactericidal properties. Even at a cost of 45c. per troy ounce, or $6.56 per avoirdupois pound, it proves its worth for special industrial uses. It finds application in chemical equipment, solders and brazing alloys, bearings, electrical apparatus, powder metallurgy, containers for food and pharmaceutical products, and silver-clad base metals. The recent remarkable rise in consumption of silver in industry and the arts as well as the consumption in selected industries is shown in accompanying tables. Coinage represents a substantial and increasing demand for the metal.

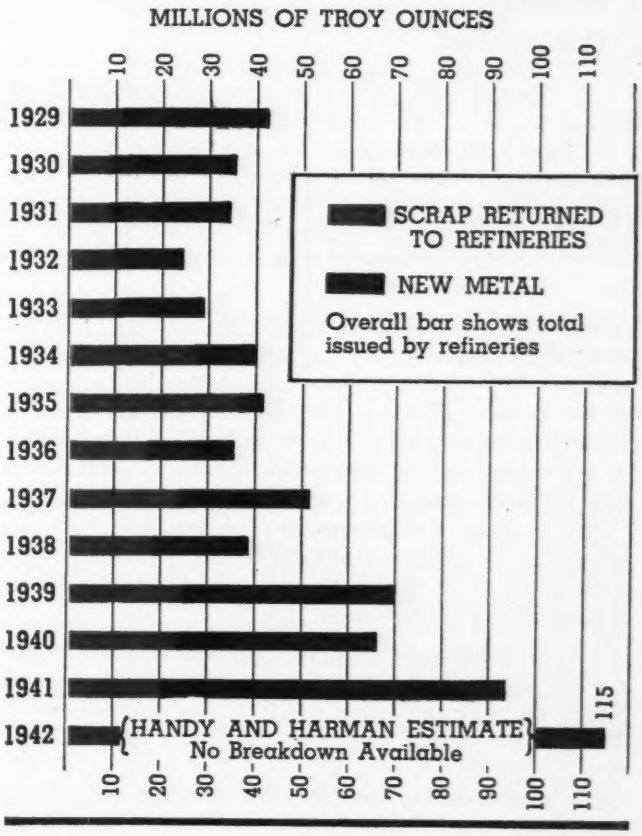
What is the postwar outlook for silver as an industrial metal? Referring to the Tariff Commission's summary, we find that: "Those uses of silver which have resulted from the scarcity of other non-ferrous metals will presumably disappear after the war, as the supply of these metals for civilian uses increases. On the other hand, some of the new uses found for silver during the war will continue. There will probably be larger use of silver for electrical purposes and in bearings than before the war. Moreover, some non-essential uses which were beginning before the war but which were curtailed by the shortage may be resumed; these include, for example, the use of silver in luggage hardware, automobile trim, and slide fasteners. The silverware industry, the largest consumer before the war, will have accumulated a considerable backlog of orders and will require substantially larger supplies of silver annually than the prewar average of about 30 million ounces. Taking it altogether, the domestic postwar demand for silver for subsidiary coinage and industrial uses will, assuming a fair degree of general prosperity, probably materially exceed the prewar demand.

"After the war, the domestic production of silver, as well as the production in those countries which customarily export their surplus to the United States, will depend largely on the price of silver and upon the prices of associated metals such as copper and lead. The price for silver in the past has been greatly affected by United States legislation with respect to government purchases of domestic and foreign silver. On the other hand, the postwar world demand for silver for subsidiary coins and for those industrial uses in which it offers marked advantage over other materials may be such as to result in prices sufficiently high to maintain a large production of silver throughout the world, whatever be the policy of our government regarding silver purchases."

Monetary Outlook

The essential role of international cooperative action in the future of silver as a monetary metal is clearly indicated in a published study of "International Bimetallism," by Francis H. Brownell, chairman, board of directors, American Smelting & Refining Co. Mr. Brownell bases his argument on the urgent need for postwar stabilization of national currencies as prerequisite to internal recovery as well as for foreign trade. He points out the necessity for a metallic standard, and cites the unhappy consequences of unconvertible paper money. He believes that large metallic reserves will be required by all nations if they are to enjoy a large volume of in-

U.S. Consumption of Silver by Industry and the Arts



How Industrial Use of Silver Has Grown

INDUSTRY	(MILLIONS OF TROY OUNCES) 1929	1931	1939	1940	1941	1942	1943
Bearings	—	—	—	—	—	10	25
Photographic goods[1]	8	7	13	12	18	20	20
Brazing alloys	—	—	—	—	—	[2]	20
Contacts	—	—	—	—	—	10	10
Dental and surgical supplies	[3]	[3]	[3]	[3]	[3]	2	5
Insignia	[4]	[4]	[4]	[4]	[4]	5	5
Solder	1	1	[4]	[4]	[4]	1	4
Chemical products, n.e.s.	2	2	1	2	3	3	3
Sterling silverware	10	9	11	14	50	[5]30	[5]30
Silver-plated ware	4	2	5	4	5		
Jewelry	3	2	3	3	3	10	5
Unclassified	2	1	1	6	1	30	32
Total	30	24	34	41	80	121	159

[1] Figures for 1939-41 represent silver nitrate. By far the largest use of silver nitrate is for photography; other uses are for silvering mirrors and in pharmaceuticals.
[2] Not shown separately; included in "Unclassified."
[3] Estimated at less than 1 million ounces.
[4] Not available, but known to be small.
[5] Figures include estimates of silver used in the production of silver-plated ware for the Army and the Navy.

ternational trade. Although both the Keynes (British) and the White (U. S. A.) plans for monetary stability use gold as a base, they ignore the importance of silver to the peoples of Asia. Mr. Brownell argues that any postwar monetary system must recognize silver as well as gold, because the latter will not be adequate as a base for world trade.

Recognizing the essentiality of international collaboration to achieve bimetallism, Mr. Brownell urges such action and claims the following advantages for international bimetallism:

1. The volume of standard money would be immediately increased, particularly outside of the United States, to meet the larger needs of the postwar world. This would enable nations to maintain the stability of their currencies even if an adverse balance of payments should compel substantial shipments of gold and silver for a time to other nations, or to the International Stabilization Fund.

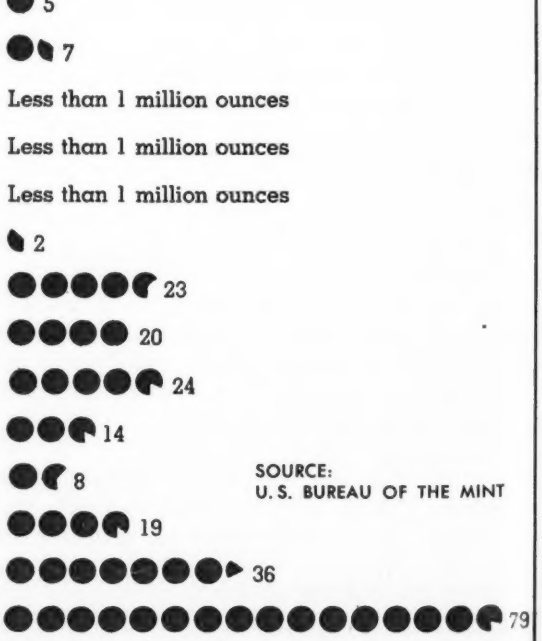
2. The yearly addition to the world's stock of standard money would be expanded, for the normal annual output of some 40,000,000 oz. of gold would be supplemented by production of some 270,000,000 oz. of silver.

3. The stock of monetary metal could be expanded further, if found necessary, through drawing in considerable quantities of silver from the arts.

4. Nations whose populations desire would be able to restore the coinage of standard money on a large scale. This has become progressively less possible as

Silver Minted by U. S.

EACH COIN REPRESENTS 5,000,000 TROY OUNCES



SOURCE: U. S. BUREAU OF THE MINT

the gold shortage has caused all governments, including the United States, to withdraw the yellow metal from circulation.

5. If a world-wide shortage of standard money should again threaten, it could be corrected through stimulating silver production and lowering the ratio of silver to gold by international agreement.

6. The adoption of international bimetallism would not make the International Stabilization Fund Plan unnecessary, but would rather help assure the success of any such plan by facilitating each nation's ability to replenish its credit on the books of the International Fund through its power to deposit silver, as well as gold, for the purpose.

7. This is the only monetary plan that assures the world at large will possess an adequate stock of monetary metals, no matter how large domestic and external trade becomes, and no matter at which points world prices are stabilized.

8. A much larger number of nations would be themselves producers of standard money under international bimetallism, and thus would be aided in maintaining the stability of their currencies through the production of monetary metals within their borders. The Western Hemisphere, chiefly Latin America, produces about three-fourths of the world's silver, and the Eastern Hemisphere turns out about three-fourths of the gold.

In Mr. Brownell's opinion, the United States should support international bimetallism because, without lessening or impairing the use of gold or damaging the monetary situation in any country, such a system would serve best its economic interests and those of the Western Hemisphere. International bimetallism will escape all of the disadvantages that arise when any one nation resorts to the use of two standard monetary metals, instead of gold alone. It retains every advantage of the gold standard, but possesses a number of additional advantages over gold. The end of the war, and the launching of a cooperative effort by all nations to restore monetary stability with the return of peace, provide an unparalleled opportunity to bring this superior international monetary standard into effect, thus assuring a more effective and lasting monetary stability in the postwar world.

Major Non-Ferrous Metals

COPPER

The metal will hold its important markets

PRODUCERS do not doubt that the postwar demand for copper will be large, but it is recognized throughout the industry that transition from war to peace will be more complex than in commodities less intimately associated with the war. Production was maintained at record levels for a period of three years and surpluses have been created to meet all possible conditions. Though government-owned surpluses are not expected to be forced on an unwilling market, numerous adjustments will have to be made to meet postwar conditions.

Reconstruction the world over will demand substantial tonnages of copper. This demand may even ease pressure from accumulated scrap supplies that must be large. Industries that normally stand high as consumers of copper are expected to resume using the metal in just about the same degree as in the prewar period. Contrary to the notion that the tremendous growth of the aluminum industry will result in sharp competition by the light metal, copper certainly will continue to serve the electrical industry in many forms.

Electrical manufactures, telephone and telegraph, light and power lines, and miscellaneous wiring absorb roundly one-half of the copper used in this country

Estimated Copper Use in U.S.–1939

	TONS
Electrical manufactures (a)	185,000
Telephone and telegraph	39,000
Light and power lines (b)	67,000
Wire and other rod (c)	95,000
Wire cloth	8,000
Automobiles (d)	85,000
Buildings (e)	89,000
Castings (f)	33,000
Clocks and watches	4,000
Copper-bearing steel	4,200
Radiators, heating	3,600
Radio receiving sets	27,000
Railway equipment (g)	2,700
Refrigerators (h)	10,000
Shipbuilding (h)	8,500
Air conditioning (g) (h)	6,000
Ammunition	14,500
Other uses (i)	67,600
Manufactures for export	51,900
Total	801,000

(a) Generators, motors, locomotives, switchboards, light bulbs, etc. (b) Transmission and distribution wire and bus bars, public utilities only. (c) Industrial wire and cable, wire in buildings, railway cars, ships, railway electrification, flexible cord, etc. (d) Does not include starter, generators, and ignition equipment. (e) Excludes electrical work. (f) Bearings, bushings, valves, and fittings. (g) Includes air conditioning. (h) Exclusive of electrical equipment. (i) Includes condenser tubes, oil-burner tubing, welding rod, screw machine products, nickel-silver and phosphor bronze products, rivets and burrs, electrotyping, utensils, meters, yacht fittings, coinage, and sundries.

(American Bureau of Metal Statistics)

annually. Unless one can visualize an electrical industry that excludes all future growth, there is no cause for pessimism about the place that copper will occupy in that field. Light-metal enthusiasts talk about aluminum wire for all purposes, but rarely consider factors other than weight that are involved in making decisions on use of the raw material. Aluminum has been used extensively for bare-wire, high-tension transmission lines, but copper comes into its own somewhere in the circuit, even though the main power line may be made of aluminum. More electric power points to greater use of copper.

Automobiles take a respectable tonnage of copper in normal times, and the automobile industry is highly optimistic about the postwar period. The metal enters into the production of radiators and other essential parts of the car. Excluding the starter, generator, and ignition equipment, automobiles produced in 1939 used 85,000 tons of copper. Nothing is in sight to diminish its use in this industry.

Modern housing developments point to the continued use of copper in construction, owing to its resistance to corrosion and general workability. The public has been sold on the intrinsic value of copper in construction, and postwar competitive items are not expected to displace the metal. Price relationship alone will not determine its use.

Brass Makers Confident

Special characteristics of brasses are being emphasized in promotion work aimed to offset claims for competitive materials. Brass is being used so extensively throughout industry that a complete list of its applications would surprise even a brass maker. Attention is being directed toward furnishing consumers with the best copper-base alloy available for a particular purpose, profiting by research conducted in the war period to meet exacting services. To take full advantage of experience gained during the war years, an important consumer of brass has asked members of the industry to check his long list of products and recommend changes in specifications for various brasses which, in the light of recent developments, would improve the mechanical characteristics of his products. The light metals are likely to offer increased competition in the postwar period, but brass makers believe they can do a better job than ever and hold their major markets.

The railroads should provide a good outlet for copper. Postwar plans call for the electrification of some fairly important lines as soon as materials become available. In many instances, existing electrical equipment has become badly worn and replacements are necessary.

Use of copper in shipbuilding will suffer, compared with the war years, but normal consumption in this field is not extensive. The aircraft industry will operate at a higher rate than in prewar years, but this hardly points to a large use of copper. Air conditioning and refrigeration, on the other hand, offer expanding markets.

Manufactures for export will increase, perhaps profiting for a time by the inability of foreign manufacturers of electrical equipment to get into production speedily. Credit arrangements and other considerations, some political in character, will exert an influence on the trend in export business.

Though the postwar volume of copper business in this country will be extensive, no one in the industry expects that it will or should approach its wartime record of 1,643,955 tons a year, established in 1943. Use of copper in 1939 was 801,000 tons.

LEAD

Market improvement is anticipated

LEAD EXPERIENCED no striking dislocation of its ordinary uses as a result of the war, and consequently faces no problem of rebuilding markets after the war is over. War uses of lead were numerous but not unusual, and mostly outside the field of actual munitions.

Examination of the customary uses of lead in peacetime gives a direct clew to the postwar outlook for the metal, and leads to the conviction that the prospects are promising. As shown in the accompanying table, storage batteries provided the largest single outlet for lead in 1939. Considering the confidence of the automobile industry in its own postwar activity, no strain is placed on the imagination to believe that batteries will be in large postwar demand and that this number one outlet for lead will call for as great a postwar tonnage as ever, and possibly even greater.

Other forms of consumption also give promise of good markets for lead. Deferred maintenance in the form of painting will call for unusually large quantities

Lead Used in U.S.–1939

	TONS
White lead	75,000
Red lead and litharge (a)	57,200
Storage batteries	198,000
Cable covering	74,400
Building (b)	50,000
Automobiles	8,900
Ammunition	42,300
Terne plate	6,000
Foil	21,800
Bearing metal	12,800
Solder	20,000
Type metal	14,000
Calking	16,000
Castings	7,500
Other uses (c)	63,100
Total	667,000

(a) Exclusive of oxides for storage batteries. (b) Includes chemical plant construction. (c) Includes lead used in tempering gasoline, brass making, collapsible tubes, lead-lined pipe, railway equipment, shipbuilding, etc.

(American Bureau of Metal Statistics)

COMPETITION OF NEW METALS with the older ones and with such new products as plastics and plywood will be increasingly a fact. Plastics and plywood, together with the light metals and alloy steels, bid fair to show great gains.

THE INCREASING RATIO OF NON-FERROUS METALS TO IRON in production, which has been noticeable for fifty years, is likely to continue, with aluminum leading the way. According to Jeffries, the ratio shifted from 1:20 in 1884 to 1:14 in 1934, and new non-ferrous production in the future is likely to increase more rapidly than new iron production.

CHANGES WILL NOT COME SUDDENLY nor will they result in disaster to the older metals. The properties and uses of these are well established, and despite their depletion as a result of the war, they will be in plentiful supply. Use will depend more than ever on merit, on adaptability to purpose, and on sound economics and technology.

METALS WILL BE USED MORE AND MORE in the postwar industrial economy, both at home and abroad, with the result that the mining industry should experience a satisfactory degree of activity.

APPROACH TO THE POSTWAR OUTLOOK for each metal, in the accompanying studies, is made by examining its latest prewar market and by considering the changes likely to occur as the result of competition. No consideration has been given here to economic factors and political controls that could easily affect the future of all industry. They have been discussed in earlier issues of *E.&M.J.*

of white lead, which, despite competition of other pigments, maintains its position among protective coatings. The future of other lead compounds appears bright.

Cable covering has been a substantial outlet in the past and should prove so in the postwar period. The increased use of the telephone, long distance and local, combined with the trend toward installations that will resist the effect of the elements, will mean an expanding use of lead-covered cable.

Though much has been said and written about the advantages of high-octane gasoline, lead producers see nothing ahead that will change the present trend in making premium-grades of fuel for automobile engines. Tetraethyl lead is expected to more than hold its own in this field. The use of lead in tempering gasoline has been steadily gaining in favor, and automobile engines designed for more efficient operation will demand high-quality fuel produced at low cost.

Solders and bearing metals containing a high percentage of lead were developed during the war as a means of conserving tin, and it seems likely that lead will retain much of this market permanently. Likewise the scarcity of tin for tinplate resulted in the use of lead in terne plate for many purposes for which the latter proved just as satisfactory as the former, and for which it will continue to be used.

Lead has profited during the war period because, being in plentiful supply, it was available as a substitute for more critical materials. Research aimed at developing new uses was carried on at an accelerated rate, leading to greater consumption as a protective coating for iron and steel. Other uses that accounted for an enlarged demand included pipe, sheet, and foil.

Consumers of lead, thinking in terms of postwar conditions, have been studying the price outlook. They realize that the price of lead has been maintained at a reasonable level throughout the war period, and that the ceiling established by the OPA would hardly retard consumption of lead products even in peacetime. Price forecasts under prevailing conditions are impossible, but the industry is convinced that panic conditions will not be tolerated politically after the war and consumers need not expect a return to depression levels.

The Lead Industries Association estimates that 10 percent of current consumption of lead is utilized primarily because of its weight, 30 percent because of its softness, malleability, and corrosion resistance, 24 percent because of its alloying properties, and 33 percent for its chemical compounds. These properties have kept the metal fairly free of inter-commodity competition, so that producers are not greatly concerned about its industrial future.

ZINC

Prospects in galvanizing are encouraging

THOUGH PRICE COMPETITION is expected to be a strong factor in the zinc industry in the transition period from war to peace, smelters nevertheless look forward to obtaining a fair share of the total volume of business

Estimated Zinc Use in U.S.–1939

Galvanizing:	TONS
Sheets	147,500
Tubes	43,300
Wire	33,000
Wire cloth	7,700
Shapes (a)	43,500
	275,000
Brass making	175,000
Rolled zinc:	
Glass jar tops	20,000
Battery cans	21,670
Photo-engraving	5,000
Boiler plate	1,100
Automobiles	1,000
Electric refrigerators	250
Other purposes	6,580
Exports	6,400
	62,000
Die casting	84,000
Other uses (b)	30,000
Total	626,000

(a) Include pole-line hardware, hollow ware, etc. (b) Includes slab zinc used in French oxide, wet batteries, slush castings, desilverizing lead, metallurgy, etc.

(American Bureau of Metal Statistics)

in non-ferrous metals that will be required to fill the void in the civilian economy.

That foreign postwar policy is destined to exert pressure on the zinc industry is seen in the growing interest taken by foreign producers in domestic developments. Recently, a foreign producer of slab zinc observed that domestic smelters had greatly increased their production, though not without the assistance of liberal foreign supplies of zinc concentrate. Being a creditor nation, he thought that the United States should give increased attention to imports in the postwar era, and suggested the economy of importing slab zinc rather than concentrates.

Galvanizing Chief Outlet

Reference to the tabulation of zinc uses will show that galvanizing is the major domestic outlet for zinc. The Zinc Institute was active in promoting the use of galzanized products in the prewar period and intends to resume its campaigns for better galvanizing and to promote the use of galvanized products as soon as material is available for the civilian market. Improvements in zinc coatings will be stressed, because something more than heavier coatings will be required to interest consumers. New types of zinc-coated sheets and wire have been developed as a result of improved metallurgical control. Zinc's reputation as a protective coating for iron and steel has made forward strides in recent years, and the industry is convinced that the trends in this field will continue upward.

Brass, normally second in importance as an outlet for zinc, may suffer temporary unsettlement in the postwar period, not because large tonnages will cease to move into consumption, but rather because the unknown factor of war surpluses will enter into the calculations of those marketing the alloy. Production of brass during the war has been by far the largest ever attained, and fears entertained in some quarters about the disposition of an unexpected large war surplus appear well founded. Authorities in Washington have pondered this question of war surpluses, and the current thinking points to a program that will not damage the industry. The enormous capacity to produce aluminum also has worried brass makers, because of possible increased competition from that quarter. Realistic study of the properties of brass, however, together with the extraordinary large number of uses into which brass enters, has of late dispelled much of the gloom. After the brass industry settles down to a normal pace, metallurgists feel confident that a substantial tonnage of brass will be used annually. New construction, the electrical industry, transportation facilities, and household appliances will call for the metal. Ease of fabrication will continue to favor brasses for many applications.

Zinc's place in die casting is being studied, and some uncertainty about the competitive position of aluminum in this field tends to obscure the outlook. Aluminum has come down in price during the war period, and the weight factor is such that price competition appears to be more threatening than ever. However, expansion in the use of die castings has increased tremendously in recent years, and the trend in this field still points upward. Consumption of zinc in die castings has increased to more than 125,000 tons a year. Characteristics such as rapid production, low operating and maintenance costs, and minimum scrap losses are expected to keep zinc comfortably situated as a raw material in this field.

Rolled Zinc Secure

Rolled zinc was consumed during 1939 at the rate of 62,000 tons a year, and it enters into the production of articles that are practically standard and free from inter-commodity competition. Except for some minor uses, the relative position of the rolled product as an outlet for zinc appears to be secure. Items that absorb a good percentage of the country's rolled zinc production are jar tops, dry battery cans, photo-engraving, and lithographing sheet. The export market also provides a good outlet for the material, and export business is expected to show an increase in the immediate postwar period.

Though zinc oxide is an important item, the bulk of the output is derived directly from ore. The rubber and paint industries are important consumers of oxide, but its use in the rubber industry of the future is somewhat obscured. So far, synthetic rubber has not called for the use of much oxide. On the other hand, a return to the natural product would be reflected in a substantial market for the compound. Use of the pigment in the production of paints, floor coverings, ceramics, and miscellaneous applications is expected to increase because of accumulated civilian demands.

The Light Metals

FOR POSTWAR CRYSTAL-GAZERS it has already become commonplace to predict a brilliant future for the light metals—aluminum and magnesium. Producers of those two metals, however, are much less vocal, realizing better than anyone else the magnitude of their immediate postwar problems. With prewar productive capacities multiplied seven times for aluminum and 100 times for magnesium, and with exaggerated wartime markets likely to shrink materially at the close of the war, producers of the light metals undoubtedly take a very objective view of the future. True, their products have unique natural properties which make them attractive to designers, and for the first time in history these metals will be available in superabundance. The latter fact is partly a headache to producers, but also a stimulus to them to find new markets for their metals. So, a great competitive offensive by the light metals may be envisaged, that will bear fruit within the early postwar years.

The principal reasons for expecting a large increase in the use of aluminum and magnesium are their potential abundance, their lower cost, and widespread familiarity with their properties. Although both will share in the demand for lightness in construction, the outlook is much clearer with respect to aluminum than it is for magnesium.

Use of Aluminum by Industry

	Percent of Total			
	Nov. '39	Dec. '40	May '42	Postwar Estimate
Transportation (land, air, and water)	29	40	63	34
Cooking Utensil	14	6	1	10
Electrical Conductor	10	5	0	8
Machinery and Electrical Appliance	15	9	6	12
Building Construction	8	5	3	9
Chemical	5	5	5	5
Foundry and Metal Working	4	23	19	9
Ferrous and Non-ferrous Metallurgy	5	4	2	4
Food and Beverage	6	2	0	5
General Miscellaneous	4	1	1	4

Aluminum

Large increase in use is forecast

POSTWAR PROBLEMS faced by the domestic aluminum industry shape up something like this: Highest prewar annual consumption, 300 million pounds; wartime annual capacity, 2,200 million pounds. The government, through Defense Plant Corporation, owns more than one-half the total plant capacity. Aluminum Company of America owns more than one-third; and it operates, for the government and itself, about 90 percent of the total plant capacity. The remainder is privately owned and operated, but financed by the government.

No crystal ball is needed to foresee that the aluminum industry cannot immediately utilize in peacetime its tremendously expanded wartime plant. How much must it shrink? Secretary of Commerce Jesse Jones recently told a Senate committee that postwar demand for aluminum might not exceed 900 million pounds per annum, although he gave no authority for his estimate. But even this is three times the volume of the best prewar year, and its realization would be a major achievement. If and when it is accomplished, it will probably result from a combination of ample supply, lower cost, gradual reduction in plant capacity by closing the least efficient and least economical plants, gradual tapering off of war demand, and equally gradual resumption of civilian use of the metal.

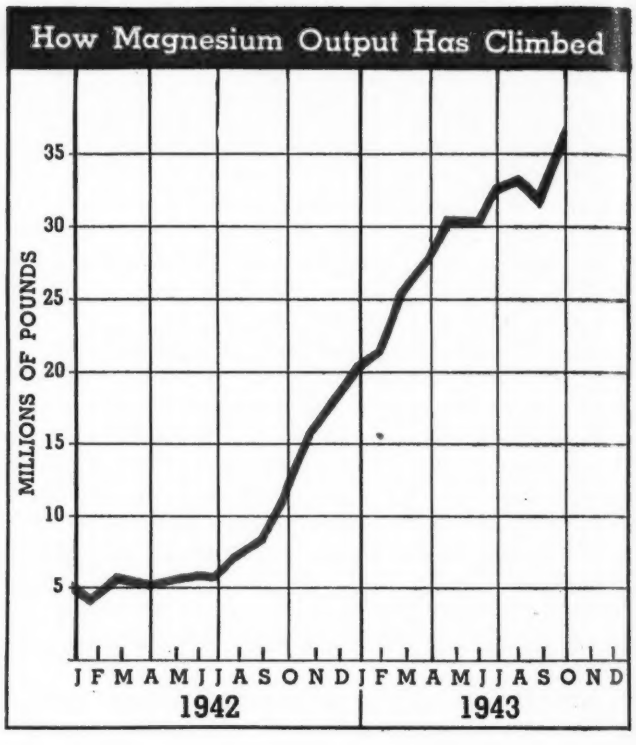
Where and how will aluminum be used postwar? The accompanying table of uses, prepared by the Aluminum Company of America, suggests the outlook. Markets will not vary much in kind from those of prewar years. The aviation industry now takes nearly 90 percent of the current production of aluminum, but that market will shrink greatly in the immediate postwar period. Transportation industries have been the largest single consumer of the metal and probably will continue to be. Airplanes, automobiles, buses, trucks, railroad passenger and freight cars, ships and life boats, tank cars, mine skips and hoists—all of these vehicles will take large quantities of aluminum.

In the electrical industries aluminum will continue to be a strong competitor of copper in bare-wire transmission lines, but is not likely to take much of the market for insulated wire and cable. The architectural field offers opportunity for structural and decorative uses of the metal. Cooking utensils will resume their place high in the list of postwar uses for aluminum from which they have been displaced temporarily. Containers and packages in the beverage and food industries will offer an attractive market. Other uses will not vary greatly from prewar records. The major market for die castings, developed and held prewar by high-grade zinc, has been largely captured by aluminum, and stiff postwar competition can be looked for in this field.

On the whole, the postwar outlook for aluminum can be considered good in an era when much emphasis in all kinds of construction will be placed on light weight and adequate strength. The long-range prospect is that aluminum will eventually be the largest-tonnage non-ferrous metal.

Magnesium

Campaign to discover new uses is needed



NO SUCH FAVORABLE OUTLOOK can be pictured for magnesium. It is a newer metal and one with which consumers have had much less experience than with aluminum. Lightness is its outstanding characteristic. But its problems of overcapacity and government ownership are much more acute than in the case of aluminum. Compared with prewar production, present plant capacity has been expanded 100 times. The government owns 94 percent of the production facilities, and probably they are all in the high-cost bracket. The principal private producer, Dow Chemical Co., is believed to have the lowest costs, both now and in prospect. It also has ample capacity to supply immediate postwar need. Government-owned plants, therefore, may not survive.

The present price ratio of magnesium and aluminum is about 1.4 to 1, with magnesium priced at 20½¢ a pound and aluminum at 15¢. If the latter should be reduced to, say, 12¢ in the postwar period, magnesium would have to drop to about 16 to 17¢ to maintain the present relationship. Similarly, if magnesium is to preserve its prewar production ratio to aluminum of about 2 percent, and if 900 million pounds of aluminum per annum is a reasonable postwar expectation, magnesium production would run about 18 million pounds. This is a far lower figure than that of 50 million pounds, currently estimated for postwar production, and very much below the productive capacity of the industry. From almost any viewpoint the postwar outlook for magnesium is marked by uncertainty and a large interrogation point. The most certain thing is that there must be a tremendous shrinkage in plant capacity and a vigorous campaign to discover uses for the metal.

METALS vs. PLASTICS

Plastics are commonly spoken of as having possibilities for serious postwar competition with metals. The assumption will bear careful examination and will be found largely unwarranted. Entirely too much popular glamour has surrounded these materials. In fact, they have probably suffered from overoptimistic predictions of their use. The essential facts are relatively simple. Plastics have many inherent properties that make them industrially useful. They are of great variety, and for the most part have found new uses not previously filled by other materials. To some extent they have been substituted for metals, but they have also found uses that metals could never fill. Finally, their tonnage production is small compared with that of the metals they are supposed to compete with, so that even if their entire output displaced metals, the effect on metal production and use would be relatively insignificant. Competition from plastics is not to be ignored, but it will not put any metal out of business. On the contrary, smart and intelligent designers will study their materials carefully and supplement metals with plastics, taking full advantage of their respective properties.

Metals for the Alloy Steels

THE CRITICAL IMPORTANCE of the ferro-alloy metals in the war effort is indicated by the rapid rise in domestic production of alloy steels when the United States took on the role of arsenal of democracy. American Iron and Steel Institute is authority for the accompanying figures on production of alloy steel, ingots, and steel for castings, which show large annual increments after 1939. Accurate figures for 1943 are not yet available, but production is estimated at approximately 14,000,000 tons, more than four times 1939 output.

No more eloquent testimony could be offered on the important properties contributed to steel by relatively small quantities of tungsten, chromium, vanadium, molybdenum, manganese, and nickel. And though the peak of war production will not be maintained when the demand for munitions falls off, nevertheless experience with the special properties and advantage of alloy steels suggests the probability that they will be produced in increasing ratio to total steel, and that there will be a steadily growing market for the ferro-alloy metals. This is particularly true if the price of alloy steels is made attractive.

Production of Alloy Steels

INGOTS AND STEEL FOR CASTINGS

Year	Net Tons
1936	3,229,657
1937	3,396,541
1938	1,653,510
1939	3,211,955
1940	4,965,887
1941	8,206,129
1942	11,526,374

In prewar years European production of alloy steel bore a higher ratio to total steel than in the United States, largely because common steel was more expensive there, and the benefits to be derived from alloy steels were large in proportion to their additional cost. One factor that may tend to reduce the cost of alloy steels in the United States is the prospective lower price of aluminum.

MOLYBDENUM Because the United States had ample supplies of molybdenum when the war broke, attention of metallurgists was immediately directed toward substituting it in alloy steels for the less plentiful tungsten, nickel, and manganese. This was fortunate for molybdenum as well as for the war effort, because it resulted in the rapid development of molybdenum steels that will probably find a permament postwar market and add substantially to prewar outlets. Thus, the metal may be said to have profited by its wartime opportunity.

The outlook for molybdenum is particularly important to the United States because even in 1940 domestic production was more than 93 percent of the world output. Currently the proportion must have risen to 98 percent, with production approximately twice the annual prewar rate. Supply now having overtaken demand, curtailment of production has already begun.

Molybdenum has some well-established peacetime markets which will be available when the war is over. Its principal use is as an alloy in the iron and steel industry. Its alloys find application in high-speed steels, in diesel engines, automobiles, and trucks, and to some extent in aircraft. Construction of railroad locomotives and rolling stock calls for molybdenum steels to reduce weight and fatigue. Oil wells and refineries are also outlets.

Producers of molybdenum are engaged in research on postwar uses and feel that the opportunities have only begun to be revealed. A fruitful field is expected to develop in equipment for high-temperature, high-pressure chemical processes and for steam generation. Certain uses for metallic molybdenum in electronics appear promising. Among chemical applications are the use of molybdenum catalysts, and the production of colors for dyes and inks.

Not the least promising part of the outlook for the domestic molybdenum industry is in world trade. In 1939 the United States exported two-thirds of its production. This activity declined sharply with the prospect of war, but should be resumed with the end of hostilities. Rehabilitation of world industry will call for alloy steels in the chemical, petroleum, railroad, automotive, and other fields, and the United States as dominant producer should be able to capitalize on its almost exclusive resource.

CHROMIUM Chromium shares with nickel the reputation derived from stainless steel as one of the most useful and best known of the alloy steels. Chrome-nickel steels not only resist corrosion under ordinary conditions, but withstand punishment at elevated temperatures. Examples are found in the exhaust systems of modern airplanes and in petroleum-"cracking" equipment, where temperatures of 1,200 deg. to 1,800 deg. F. prevail. Small quantities of columbium improve the useful properties of stainless steels, and more could be used to advantage if available.

Chrome-alloy steel production in the United States was expanded from 180,000 tons in 1939 to 341,000 tons in 1942. Details for chrome steels are given in the accompanying tabulation furnished by American Iron and Steel Institute.

The outlook for chrome-alloy steels is bright, not only for uses already established but for prospective applications in various industries. Food-processing equipment, hospital and household supplies, transportation equipment of all kinds, chemical plant equipment—all use to advantage the unique properties of chrome and chrome-nickel alloy steels.

Chromium has also an established market in the

Chrome-Alloy Steel Production

THOUSANDS OF NET TONS OF INGOTS

Year	18-8 Cr-Ni	12-14 Cr	16-18 Cr	All Other High Cr or Cr-Ni	Total
1939	81	23	34	42	180
1940	125	38	65	22	250
1941	164	63	102	43	372
1942	202	63	23	53	341

manufacture of chemicals—chromates and dichromates—for the dyeing, tanning, and pigment industries. Chromite refractories for metallurgical furnaces comprise the third group of industrial uses.

Unfortunately, the United States produces relatively little of its requirements of high-grade chrome ore, and after the war consumers will probably still be dependent on foreign sources. The anomalous situation prevails that the principal consuming countries are not heavy producers, and vice versa.

VANADIUM Although classified as critical rather than as strategic, vanadium is highly regarded for the properties it contributes to steel when alloyed therein with other metals such as chromium, molybdenum, titanium, and aluminum. Peru was the principal producer, even in 1938, and rapidly expanded its output. The United States ranked second.

The postwar outlook is that vanadium will gradually recover its former uses under relaxed wartime controls. Because domestic reserve stocks were negligible, even as late as 1943, the WPB asked that a stockpile of 3,000,000 lb. of ferrovanadium be accumulated. That was done, and the present situation is that production is ample for current requirements, with demand falling off. Producers have therefore been urging that all governmental restrictions on use of vanadium be vacated. With government stocks reaching their goal, the control of production and distribution could well be returned to the industry.

TUNGSTEN No metal was more strategic than tungsten for war purposes, on account of its use in high-speed tools for metal cutting; and the shortage of supply led to the substitution of molybdenum and vanadium in a new series of alloy steels. Despite extensive exploration by the government, which resulted in discovery of some new resources, domestic production was inadequate. Supplies from China were cut off and Latin America became an important source.

The war emphasized the strategic importance of tungsten, but developed no new uses for it. The postwar outlook, therefore, is that it will recover its peacetime applications except to the extent that it has been displaced in alloy steels by other metals. Its properties are so extraordinary, however, that it is likely to grow in favor, and enjoy steady expansion in production and use. As in the past, postwar domestic production will probably be inadequate to meet home demand, and imports will be necessary.

MANGANESE The fortunes of manganese are so directly tied to those of the steel industry that the postwar outlook for it may be said to depend directly on activity in steel production. About 12.5 lb. of manganese is needed to deoxidize and desulphurize every short ton of steel. Add to this the fact that the United States has normally relied on imports of high-grade manganese ore, and probably will continue to do so after the war, and one sees that the postwar outlook for domestic manganese has not been greatly enhanced. Some success has been achieved in concentrating domestic low- and medium-grade manganese ores, but in a recent review the Bureau of Mines reported that the utilization of domestic ores "awaits an entirely satisfactory and completely demonstrated method for effective beneficiation."

In addition to its principal market, manganese is used also in non-ferrous alloys, such as manganese bronzes. Electrolytic manganese is used for this purpose, because it introduces no iron into the alloy. This use is likely to enjoy normal growth and expansion. Unusually pure, high-grade ores also find relatively small outlets in the dry-battery, chemical, and ceramic industries.

Since no revolutionary products have resulted from the availability of electrolytic manganese, its use in postwar trade is expected to progress along conservative lines. Production was sufficient as 1943 ended to take care of all essential needs.

NICKEL Nickel will come out of its Second World War experience with a much more favorable postwar outlook than it enjoyed 25 years ago. At that time it had the dubious reputation of being primarily a munitions metal; but in the interim it has found such extensive industrial uses that producers can now look forward to supplying well-established peacetime markets. Consumption of the metal will naturally recede from its wartime peak. But when restrictions on use are removed, there is likely to be an extraordinary demand to satisfy the pent-up industrial market. Thereafter, production and consumption will revert to a more normal state. The increased use of nickel in war applications is likely to be reflected in peacetime demand, and some new uses will appear that cannot now be revealed.

With a few exceptions the pattern of postwar nickel consumption will not differ greatly from that of prewar. It is in the variety of nickel alloys that the largest consumption occurs. Alloy steels head the list and may account for two-thirds of total consumption. Best known are the stainless steels. Although the development trend has been toward lower nickel content in alloy steels, it is nevertheless believed that the markets for nickel alloy steels have been broadened and will result in an increased consumption of nickel.

The increasing use of high-temperature industrial processes will afford an expanding market for nickel-alloy steels. Nickel cast irons also are growing in favor where abrasion resistance is desired. Nickel plating is a field that is likely to expand, and nickel-clad metals will probably grow in favor. Alloys of nickel and the non-ferrous metals will doubtless show substantial growth. In short, the postwar outlook for nickel can be regarded as favorable.

TIN

Prewar consumption rate will rule

ALTHOUGH the United States has no known tin deposits of commercial importance, it is the largest single consumer of tin and possesses what is probably the most modern tin smelter in the world. It has, therefore, a substantial industrial stake in the future of tin.

The most important outlet for the metal has been tinplate, accounting for more than 50 percent of total domestic consumption. As a war conservation measure the conventional process of hot-dipping was largely superseded by continuous electrolytic deposition on cold-rolled strip steel at the rate of 1,000 ft. per minute. Whereas it was not practical to apply tin coatings by hot-dipping that were less than 0.000075 in. thick (1.25 lb. per base box), electrolytic tin coating of only 0.00003 in. thickness (0.5 lb. per base box) was developed and used for many products, particularly if the tin coating was "enameled" with a varnish. The prediction is now made that electrolytic tinning will make possible the deposition of any desired weight of metal, from 0.1 to 1.5 lb. per base box. As a war measure the process resulted in a substantial saving of tin. Likewise it now raises a question as to future use of tin in quantity for tinplate.

Competent authority in the industry expressed the opinion that, in spite of conservation measures, many of which will persist, the prewar rate of domestic tin consumption will probably continue after the war. Although much electrolytic tinplate may then carry only one-half to one-third the customary tin content of hot-dipped plate, it will be proportionately cheaper and more uniform in quality. The net result should be an increase in the consumption of tinplate in a greater variety of uses, sizes, and qualities. It is not expected that hot-dipping will be replaced entirely by electrolytic coating. In food canning, the extent to which electrolytic tin plate can supersede hot-dipped plate will depend on what further research reveals regarding the minimum weight of tin required to give the necessary service. In view of all the possibilities, it seems likely that the postwar consumption of tin in tinplate of various grades will continue at least at the prewar rate.

The second important prewar outlet for tin was solder, representing about 15 percent of total domestic consumption. Development of tin-free solders became necessary as a war conservation measure, and many of these will continue to be used. In fact, the 97½-2½ lead-silver solder has proved acceptable in food canning. Industry has learned how to apply the products and has found them satisfactory for many purposes. Some operators will go back to the use of high-tin solders, and research will be undertaken to improve their position. Nevertheless, the loss of this market to low-tin, high-lead, and silver-lead solders seems likely to be substantial.

Likewise in the case of babbitts, which represented about 5 percent of prewar tin consumption, it is probable that the substitute lead-base alloys will continue to be used in the automotive and railroad fields, and that tin will suffer a loss of market, at least temporarily. Here again research may come to the rescue of tin and re-establish it in place of the substitute material.

Bronzes, however, are expected to account for an increase in prewar tin consumption, even though the tin content may be reduced. The newer methods of precision casting of metals might be applied widely to bronzes, and this, with the more extensive use of bronze in machine parts, should bring about a substantial increase in the use of tin.

A minor market for tin that may be taken over by competitive materials lies in the manufacture of collapsible tubes. The tin-foil market has long since been captured by aluminum, and the collapsible tube market may likewise capitulate to that metal. Certainly aluminum producers will make every effort to take over the manufacture of tubes.

Outlook for Smelting

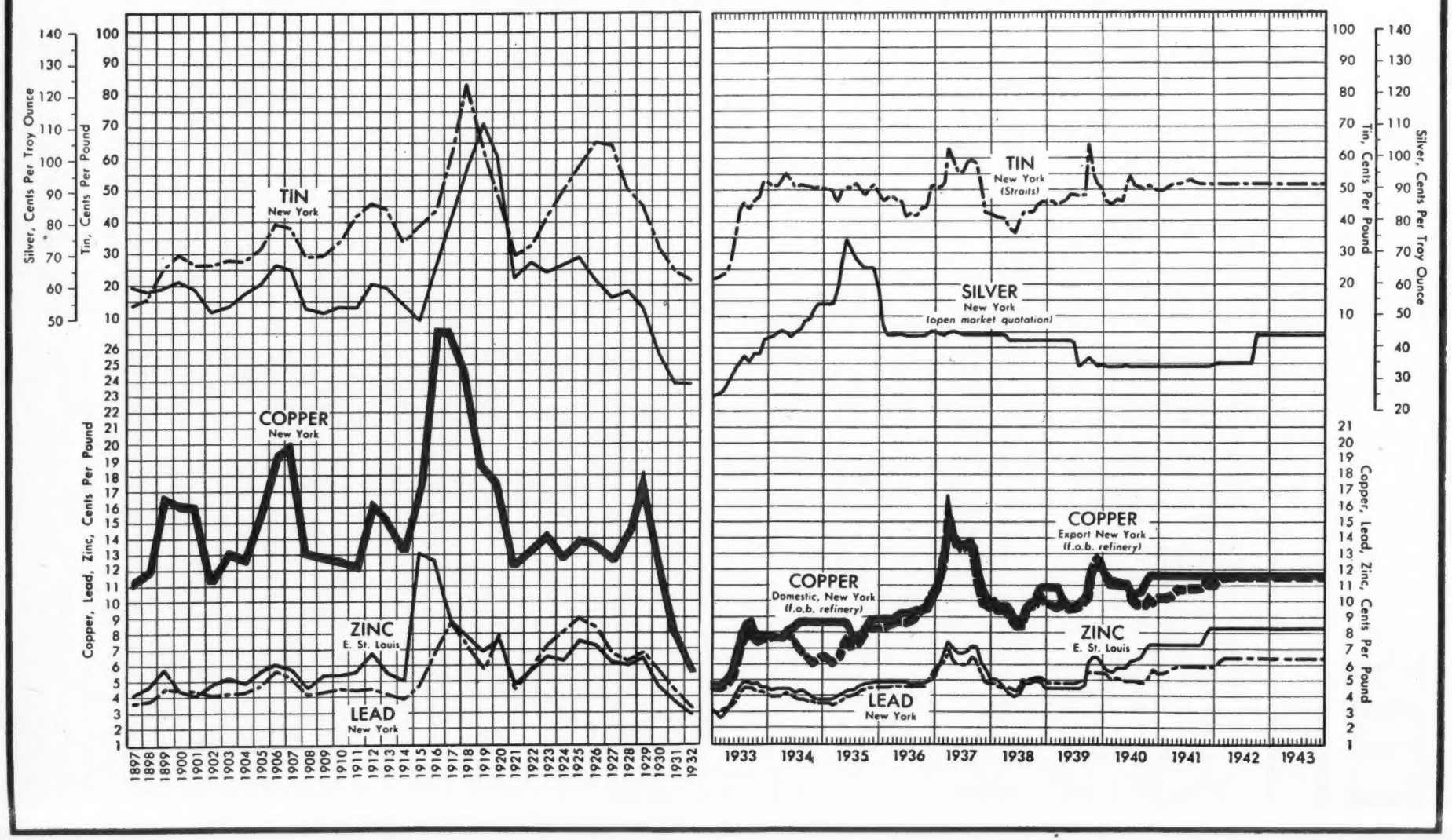
The postwar outlook for tin smelting as a domestic industry is uncertain, depending wholly on international relationships at present unpredictable. Certainly tin smelting in the United States cannot survive open competition with British and Dutch production that prevailed in the prewar era. These nations control the principal alluvial deposits of tin. They have their own smelters, and if they choose to resume operations where they left off, they can again control the smelting business. Lode tin cannot compete in cost with alluvial tin, nor equal it in grade or smelting efficiency, and yet the former is the kind of ore from Bolivia on which our tin smelter now relies, and would have to rely, if the British and Dutch prevented access to alluvial tin.

That the international tin cartel intends to capitalize its advantages to the utmost, and promote the wider use of tin, is made clear in postwar research and development plans recently announced in England by the Tin Research Institute. The major problem is to "create a market" that will "maintain producers at a reasonable level of activity." The Institute estimates that this would require an annual consumption approaching 250,000 long tons of tin—an ambitious figure in comparison with a prewar ten-year average world's production of about 175,000 long tons.

An important aspect of the international scene is the United States' interest in supporting the economy of Bolivia, which is largely dependent on tin. Would Uncle Sam subsidize his tin smelter in order to be a good neighbor to Bolivia? Or might international accord among the United States, England, and Holland give us access to better resources and at the same time bring the U. S. A. into an international tin cartel? Either arrangement would continue to hold an umbrella over the tin industry of Bolivia, but for which it might long since have collapsed and left the United States without any tin resources in the Western Hemisphere. Until postwar international relationships are clearer than they are now, no one can predict the postwar outlook for tin smelting in the United States.

E & M J METAL PRICES 1897 - 1943

(Annual averages 1897-1932—Monthly averages 1933-1943)



Developments and Trends of the Year . . . .

in Mining, Ore Dressing, Metallurgy

1 Role of Mining Geology of Growing Importance

CHARLES H. BEHRE, JR., *Professor of Geology, Columbia University, New York*

CHANGES WROUGHT BY THE WAR in the activities of mining geologists in the United States, typical of those the world over, have remained much the same as in the preceding year. Efforts to find ore have merely been intensified. Despite the scantiness of news from "Festung Europa," the same condition doubtless prevails there. The story is one of moderate discoveries, measured in thousands rather than millions of tons of ore, or of the failure, as the Cornish put it, to "hold the ore" in some mine. Growth of theoretical knowledge has not been greatly increased by the war.

With two years of fighting behind us, the occasion is appropriate for taking stock—for counting up the lessons learned by American mining geologists. Increasingly, the role of this country in maintaining the production line has been demonstrated. It has been a war of attrition, and, thanks mainly to American efforts, the advantage has swung from the prepared Axis to the United Nations. In the mineral field the strain of continued production has been not only upon material supply but especially on manpower, including exploration personnel, geologists, and geophysicists.

The strain on geologists was great for three reasons: They were drawn at once, in large part, into the vortex of military operations; as company men they were diverted from exploration to day-to-day production; and they were called into various government branches, such as the Geological Survey, War Production Board, Metals Reserve Company, and the Bureau of Mines. For a long time, moreover, men specially qualified as geologists were still subject to direct conscription with no recognition of their unique training. Employers hesitated to take the really patriotic stand of requesting the deferment of their geologists, though assured by government officials of the basic importance of wartime mineral industries. The younger men were therefore drafted or enlisted to enter preferred branches of the service.

EXPLORATION for needed ores has taken parties of geologists from the U. S. Survey and various government agencies into all parts of the country. Here the trail follows a joint in Navajo sandstone, in Utah

Not until the past summer were those geologists who were engaged in mineral production placed on the list of specialized workers meriting deferment.

Meantime the various geological surveys were rapidly expanding. The United States Survey increased the staff of its geologic branch threefold in an effort to meet mounting demands for information; coordinating its efforts with those of the Bureau of Mines, it established parties to advise in drilling campaigns conducted by the Bureau, while other parties engaged in independent surface or underground studies. Thus the supply of practising mining geologists was quickly exhausted, and men had to be drawn from other sources. Younger, somewhat less experienced men were taken into the work and rose to meet the demands placed upon their ingenuity and training. This turn of events has been healthy for the profession because it stimulated the outlook of geologists as a group, broadened the experience of the average geologist, and strengthened the profession's value and prestige. Mining engineers, through being more intensively associated with geologists, stood in a position to learn to what extent their profession differs from that of the mining geologist, and to what extent the two kinds of work overlap and supplement each other.

Self-Criticism

Out of this heightened activity, however, certain needs of the geologic profession are apparent. For one thing, there is no good directory of mining geologists. "American Men of Science," the membership lists of the Geological Society of America, of the Society of Economic Geologists, of the American Institute of Mining and Metallurgical Engineers, and the American Association of Petroleum Geologists are all incomplete as directories of American applied geologists. Their arrangement is largely an alphabetic listing only, such that a smaller mining company can find in none of them a guide to specialists in a given product or region. Something of the desired sort is at least under way, originally urged by W. H. Bucher when chairman of the Earth Science Section of the National Research Council and now being ably forwarded by the Geological Society of America under the careful planning of its secretary, H. R. Aldrich. A supplementary step in making geologic manpower available is a special committee on personnel appointed by W. W. Rubey, the new divisional chairman of the National Research Council. Participants in this action are the A.A.P.G., the S.E.G., and the G.S.A. and its affiliates.

A second shortcoming has been made apparent by the war. This is in the training of some members of the profession. Every technical career is founded on its basic sciences, in this case physics, mathematics, and chemistry, no less than the related professions of mining and metallurgy as well as the many subdivisions of geology, from geomorphology to orthodox "economic geology." But the broad field of mineral economics appears to have been omitted from the background of appreciable numbers of geology graduates except in its most simple geographic and statistical aspects. Ore sale and purchase, the effect of modifications in milling, changes in demand produced by metallurgical improvements—all these are neglected fields for many otherwise well-trained geologists.

Too little time, also, is set aside in curricula for the basic skills. Courses of broad theoretical value are spread too thinly and too widely, perhaps because of the dominance by "pure scientists" over the curricula in mining geology. It is as though the training

of physicians consisted of the Ph.D. requirements in pharmacology or anatomy or physiology; the basic sciences would gain considerably thereby, but the professional training would lose most of its purpose and usefulness. It is to be hoped that a more balanced viewpoint will prevail in the academic world after the war.

Emphasis on Structure

In the study of ores and related nonmetallic minerals the emphasis in applied geology has lately swung strongly from the mineralogic-petrographic viewpoint, which dominated the profession thirty years ago, toward one upon the controlling structures. This tendency has been greatly accelerated by the war. The newer conception carries more dangers because each district has its own peculiar variables, and there is always a temptation to fit the facts to the generalizations. Balancing this weakness, however, is the possibility of forecasting concretely where the ore will probably be. The mining geologist is thus placed in the position already familiar to the petroleum geologist, of searching for favorable structures. Yet finding these, of course, does not assure finding the ore, for ore solutions move for a shorter period than petroleum and do not always ferret out the openings, even assuming the solutions were once present. Petroleum structures are thus less likely to disappoint the "intelligent wildcatter."

As yet little exploration for ore has been stimulated by favorable structure in itself. Such exploration seems to involve too great a risk, and shortages are not yet great enough nor ore prices sufficiently high to stimulate private capital. Our technique for selecting favorable structures still smacks too much of the divining rod. A successful campaign or two by government agencies may point the way.

Perhaps the largest immediate fact confronting American economic geologists is the extent to which the national mineral reserves are being drained. For virtually all the mineral products which the United States was expected to furnish in large quantity the supply is equal to the wartime demand, zinc and copper possibly excepted; indeed, the intensive countrywide search yielded reserves of many mineral products which even exceeded the best hopes of competent geologists. But the peacetime problems are already written for him who runs.

The United States, long regarded as a boundless reserve of the heavy metals, is becoming strikingly dependent on imports in place of domestic minerals. Search will therefore grow progressively more intensive and refined. Geologists will be used in moderate-size and even small operations, as they were in prewar Europe, not merely in large ones. Conservation in use—getting the most results out of the least production—will be the rule, with a correspondingly increased demand for all the technical help available.

Printed Record Lags

Much that was done in 1943 has not yet been made public; some, being of strategic importance, will find its way into print only after the war. Below are mentioned certain of the more important publications in 1943. The fundamental problems facing the mining geologist, like those of the mining engineer, are as much political and economic as technical and scientific.

Postwar production raises several questions, especially that of stockpiling (discussed by W. O. Hotchkiss in *Mining and Metallurgy* for May and by Evan Just in *Engineering and Mining Journal* for July); federal control of mineral deposits on public lands (*E.&M.J.*, September); and foreign sources of minerals (A. M. Bateman in the April *E.&M.J.*). Recent texts, especially "World Minerals and World Peace," by Leith, Furness, and Lewis (Brookings Institution, Washington), and "Minerals in World Affairs," by T. S. Lovering (Prentice-Hall, New York), emphasize the same problems.

As to national resources, an article by W. L. Batt, vice-chairman of the War Production Board, indicates that for the war at least the United Nations are "solvent" as to their mineral supplies (*Min. and Met.*, July). Summaries of the mineral wealth of various countries were published in 1943, covering China (Chung Yu Wang, *Min. and Met.*, September), Africa (A. W. Postel, "Mineral Resources of Africa," University of Pennsylvania Press), Spain (F. W. Cannady, *E.& M.J.*, September), and Alaska (H. R. Joisting, "Strategic Mineral Occurrences in Interior Alaska," Alaska Department of Mines). Bateman's useful text ("Economic Mineral Deposits," John Wiley & Sons), McFarlan's "Geology of Kentucky," Northrop's "Minerals of New Mexico" (University of New Mexico Press), George's "Minerals and Rocks" (Appleton-Century Co.), Schuchert's "Stratigraphy of the Eastern and Central States" (John Wiley & Sons), Nolan's "Basin and Range Province of Utah, Nevada, and California" (U. S. G. S. Professional Paper 197–D), and W. H. Emmons' article concerning oreshoots on warped fault planes (*Min. Tech.*, January), all published in 1943, are important contributions to the background or technique of mining geology whose titles indicate their scope. Two useful books on mapping are H. T. U. Smith's "Aerial Photographs and Their Application" (Appleton-Century Co.) and W. C. Putnam's "Map Interpretation With Military Applications" (McGraw-Hill Book Co.). Of value to the technique of mining geology are H. R. Braml's ingenious structure chart for solving three-dimensional problems (*E.&M.J.*, July) and T. T. Read's discussion of the polygon method for ore estimation (*E.&M.J.*, August).

Studies of Ore Deposits

The newly restudied replacement hematite ores of the Steep Rock district, Ontario, have been well described by H. M. Roberts and M. W. Bartley (*Econ. Geol.*, 28, No. 1, and *Min. Tech.*, January) and by H. C. Rickaby (*Min. and Met.*, October). They represent Canada's largest iron reserves. Similarly, interest is again awakening in the iron-ore deposits of Minas Geraes, Brazil. It resulted in brief but pointed accounts by Malozemoff (*E.&M.J.*, December, 1942, and January, 1943) and by F. G. Pardee

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"The peacetime problems are already written for him who runs. The United States, long regarded as having a boundless reserve of the heavy metals, is becoming strikingly dependent upon imports. . . . Search will therefore grow progressively more intensive and refined. Geologists will be used in even small operations, as they were in prewar Europe, not merely in large ones. Conservation in use will be the rule."

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(the same journal, October). Opinions differ as to the conditions governing their economic workability; their importance and extent remain indisputable. Next to these the Adirondack iron ores have drawn most comment, the November issue of *Min. and Met.* having been devoted to them. Not only are these iron ores valuable as supplementary deposits near eastern industry, but some of them offer titanium and vanadium as byproducts as well.

As to the other major metals, an up-to-date summary of the geology of the Tri-State zinc district by George Fowler (*E.&M.J.*, November) is welcome.

Gold, strangely enough, still receives attention from mining geologists. A good paper on the mechanism of gold deposition (W. W. White, *Econ. Geol.*, 28, No. 6) concludes that the precious metal is generally late, even in reputedly hypothermal ores, and suggests that its temperature of formation may be lower than generally inferred. Another by F. Gordon Smith subscribes to the theory that the gold is chiefly transported in alkaline sulphide solutions (*Econ. Geol.*, 28, No. 7). P. A. Bundy describes some gold lodes of Bolivar, Venezuela (*E.&M.J.*, January).

Among the minor non-ferrous and ferro-alloy metals, interest is conspicuously maintained in tungsten, manganese, and mercury. Ke-Chin Hsu has published a timely description of the tungsten deposits of Southern Kiangsi, from which come 70 percent of China's tungsten concentrates (*Econ. Geol.*, 28, No. 6). L. K. Wilson describes the tungsten deposits of the Darwin Hills, Inyo County, Calif. (*Econ. Geol.*, 28, No. 7). The Hamme tract, a new discovery in Vance County, N. C., is described in *E.&M.J.*, Sept., page 72; likewise the Fresno County, Calif., scheelite deposits (Andrew Thickstun, *E.&M.J.*, July), and the now famous Yellowpine deposit, Idaho (Bradley, Mecia, and Baker, *E.&M.J.*, April). An article by Greenwood discusses the effect of chemical impurities on the luminescence of scheelite, and thus bears on tests suggested for quick grading of tungsten ores (*Econ. Geol.*, 28, No. 1).

Johnston and deSouza describe the banded chromite ores of Campo Santo, Brazil (*Econ. Geol.*, 28, No. 4). T. A. Hendricks and W. M. Laird give an account of the Turtle Mountain, N. D., manganese deposits (*Econ. Geol.*, 28, No. 7). Fleischer and Richmond report their thorough studies of the manganese oxides (*Econ. Geol.*, 28, No. 4). The sources and production of magnesium (scarcely still to be classed as a *minor* metal) are well outlined by P. D. V. Manning (*Min. and Met.*, August). A careful investigation of the system Fe-Ni-S by Hawley, Colgrove, and Zurbrigg (*Econ. Geol.*, 28, No. 5) leads the authors to conclude that there is new evidence of solid solution of Ni in pyrrhotite. A convenient summary is given by G. O. Argall (*Colorado School of Mines Quarterly*, 38, No. 4) of the occurrence and production of vanadium.

Among studies of non-metallic minerals other than fuels, mention should be made of the article by G. M. Kay on chemical lime in the mid-Ordovician rocks at Bellefont, Pa. (*Econ. Geol.*, 28, No. 3); of a report by H. S. McQueen and P. G. Herold on two major Missouri fireclay districts (*Mo. Geol. Survey, Vol. 28*); of a paper on barytes in eastern Tennessee (*E.&M.J.*, January); and of an interesting study by H. D. Miser of the quartz deposits of Arkansas and Oklahoma (*Econ. Geol.*, 28, No. 2), which shows that the quartz was magmatic in origin and deposited during the late stages of Pennsylvanian orogeny. Several recent publications deal with pegmatite minerals. Quirke and Kremers discuss the association of rare-element minerals in pegmatites and cite tests for them that are practicable. *E.&M.J.* for August takes up the uses of mica in the war, feldspar production in North Carolina, and sillimanite deposits of South Carolina.

Many government agencies are preparing and filing reports, in large part necessarily confidential, dealing with the geology and reserves of various mineral deposits. When some of these are made public after the war they will prove to be valuable additions to our knowledge of American reserves and of the occurrence of mineral deposits. The U. S. Geological Survey has been perfecting a means for making more rapidly available certain preliminary geologic reports and maps. This represents a great step forward, and will, it is to be hoped, be carried over into peace times.

2 Many Improvements Mark Mining Practice

S. A. TRENGOVE, *Chairman, Department of Mining Engineering, School of Mines and Metallurgy, Rolla,*

DEFINITE IMPROVEMENT in miner-training programs is reported to be bearing fruit. At some properties special apparatus and properly trained instructional staffs have been set up to teach the common techniques of the miner's work. Generally speaking, the age average of miners has increased during the war. The quick-moving, fast-thinking, energetic youngster is in great demand if he can be obtained, properly trained, and put to work in essential mining operations. It is hoped that serious consideration will continue to be given to job-instruction training in the postwar period.

Supervision has experienced a sort of upgrading under some conditions through the type of demand now made upon it. Not all mine mechanization has been entirely satisfactory, even though necessary because of manpower shortage. One new aid to supervisors is an instrument known as the "shiftograph," designed to help the foreman with his crew sheet. By turning a dial, one can tell what crews will work, the days they work, and their days off. It even provides for several different plans of crew rotation. Herein all crews share alike in desirable and undesirable work shifts. Physiologists are studying the multiple-shift problem in industries with a view to establishing the best shift for certain age-brackets. It is well known that several

SLUSHING EFFICIENCY has been increased by widening use of remote control of the hoist, which permits the operator to stand at a distance

weeks are required to become accustomed to any particular shift and that too frequent changes may produce undesirable results with workmen. Shifts should be steady or of infrequent rotation, the physiologists conclude. Mining men should not lose sight of the possible value of such studies.

In the Shaft

Application of the principles of rotary oil-well drilling to the problem of shaft sinking in loose water-bearing ground has recently increased. Several new shafts have been sunk in the Arkansas bauxite area by this not-too-well-known method. There it has achieved preference over standard methods. A regular rotary oil-well outfit is set up, including derrick, rotary table, draw works, and mud pumps. Commencing with a 9-in. bore, the shaft is reamed larger by stages until the desired diameter is reached. Shafts over 300 ft. deep and 6 ft. in diameter have been completed. The finished job consists of a 6-ft. diameter steel shell completely incased in cement. Such a shaft requires reaming the hole to 84-in. diameter. Mud fluid of proper specific gravity and colloidal properties fills the hole during the process. New applications for shaft sinking by the rotary shot-drill method are also noted. The method has several excellent records to its credit.

One operator has arranged a novel escapeway in a concrete, mine air shaft. The escapeway is a 30-in. diameter tube cast in the monolithic concrete lining. The ladder rungs are set with the lining and allow 24-in. of body room with off-sets every 45 ft. Being independent of the air course, this escapeway answers all demands of safety.

Some of the Mesabi Range operators handling a lot of timber now place a small tugger hoist and sheave in the upper frame of the timber cage. Timber truck and load are hoisted to vertical position and set into a depression in floor of cage. At bottom the procedure is reversed to obviate unloading one piece of timber at a time.

Improved protection to cage users is offered in a new lay-lock safety clamp. This has a positive locking grip, as its two halves contain molded zinc inserts which grip the cable in "every nook and cranny." The cable is thus enbedded in solid zinc and cannot slip.

A novel method for lifting ores out of mines has been proposed. The ore is crushed to 3-in. size and lifted to surface by means of a magnetic mud fluid through a 12-in. pipe. The magnetite medium is forced downward through a smaller pipe within the 12-in. The ore is carried upward in a steady stream.

In Drilling the Round

The increased tendency to ease work on the miner explains the increase in such labor-saving devices as self-feeding rock drills.

One analyst of the rock-drill problem notes that a rock drill should be dismantled and the usable parts saved for other drills when the cylinder is worn out. This point occurs when drill tests indicate that the cylinder is 10 percent below maximum efficiency. Since purchase of drills part by part increases the initial cost by 25 percent, the minimum cost per foot is indicated by dismantling at the time mentioned. Some operators find it advisable to rebore and bush cylinders to conserve materials.

A gooseneck of steel tubing is substituting for the rubber water-hose connection in some mines. Some are also using shorter hoses wherever practicable. In one operation a collapsible pipe unit consisting of five 5-in. lengths of pipe connected at each joint by two 90-deg. ells and a short nipple replaces hose. This is connected to the main 2-in. air line by a short hose.

Worn-out detachable drill bits have found at least one use. One operator uses up about 4 tons a month by substituting them for 30 percent of the ball load in his ball mills. Another operator has developed an effective bit sorter. Worn bits are fed by hand

into a slowly revolving table and carried around in single file until each strikes a baffle corresponding to its height. Then it is automatically pushed off into a steel chute feeding its proper storage bin. A simple revolving drum for washing detachable bits is being employed. Its inner drum fitted with rows of 1/32-in. holes solves the problem of washing the bits with water at 110-lb. pressure.

Use of the drill-jumbo has recently been enhanced by having the manufacturer furnish the car as well as the multiple drill mounting. The new cars are conveniently fitted to take care of all fittings, drilling supplies, and other needs.

Scraping and Haulage

Automatic and remote controls for scrapers are now available for standard scraper jobs. In using the remote control the operator stands at a vantage point and controls all scraper movement with a small pushbutton device held in his hands. In certain special installations automatic controls utilizing limit switches are also finding increased favor. Small portable air and electric tuggers continue to increase in popularity and usefulness. Some scraping operations are best done with this type of hoist. They are now said to be profitably employed in any location customarily served by a wheelbarrow and can be mounted on turntables to increase their usefulness. Low-clearance tunnel-loaders of capacity up to 4 tons per minute have come into use as a leading factor in meeting the manpower shortage.

A fluid drive is now used on some scraper hoists to protect the motor from burnout on stalling. The whole mechanism is protected from strains and shocks. Automatic anti-backlash control prevents the cable from piling up and snarling, thus adding to cable life and safety.

Mine cars with ends that cannot pull off are available in a type having a new "floating-draw bar." A steel member runs free from end to end inside the car and transmits pull and shock to rear end of car.

More mechanization in mines definitely means more power. The excellent storage batteries now available are helping to increase this needed latitude in mine power sources.

Rail-bonding is now being done in some places by means of wedge-type bonds installed quickly with a few taps of the hammer. The practice of thermit-welding rail joints of mine-haulage track will put an end to rail-joint-bonding maintenance and power losses in numerous places.

The practice of converting direct electric current nearer the working place by means of portable underground substations and Ignitron rectifiers saves considerable copper and reduces energy losses. The "megger," or ohmmeter, measurements are still the best guide to insulation resistance if taken at regular intervals.

A new gas-proof splice box for power cables underground should be welcomed in certain areas. It is quickly assembled to make a permanent safety connection.

A new cable hanger of durable glass fiber is impervious to moisture and will not stretch or shrink. It is being used to support loads up to 200 lb.

For defining dark passageways and making obstructions visible in the dark, a new flexible synthetic resin sheet covered with small glass beads is available. Such a reflector can be had in a variety of colors and can be cut to any shape desired by the user.

The number of mines now operating their own timber-treating plants and the number of operators purchasing treated timber indicate increased appreciation of the value of mine timber preservation. Some preservatives of excellent record need only to be brushed on to be effective under certain conditions. At least one such type is applicable to green timber without prior seasoning. It is believed that something on this order is what the miner really wants so as to simplify the task. Ties of treated timber with steel-tie top armor are creating impressive savings, as they can be used over and over again.

The sealing of mine roofs by special preparations can be successful in many workings in preventing roof falls. More attention is needed from all angles before this prolific source of mine accidents can be eliminated. Approach is being made from the standpoints of structural weakness in the roof and weaknesses developed through weathering, either by addition of moisture or oxidation.

Improving the Air

A special air-water treatment is being found useful in which entering air is spray-cooled to a condition where it enters the mine carrying only such water as it can carry at the interior temperature of the mine. Any water carried along as fine mist is eliminated by large baffles constructed at right angles to the air route. This method has also proved effective in cooling hot places ventilated by auxiliary blowers.

A case is noted where an operator has installed tire-tube valves in ventilation tubing to aid in draining. The ventilation man now simply operates this valve to let the condensed water out, whereas previously the miners ruined much tubing by knife-slitting to accomplish this. One operator demonstrates the almost perfect solution to the problem of raise ventilation by having the raise follow up a vertical drill hole. He used an 8-in. hole and was able to return to the face 20 minutes after blasting.

Dangerous gases may be drawn from mines prior to mining by sinking pipes into the ground ahead of the workings. Suction can then be applied. In coal mines, this is proving effective either by the use of vertical or horizontal holes, with a worthwhile saving of millions of cubic feet of natural gas, otherwise lost.

Improvement in wetting agents for reducing the dust hazard is also noted.

Dry ice may shortly have an important place in mine fire fighting, providing for needed cooling, exclusion of oxygen, and addition of an inert gas. At present the problems of placing are still in process of solution.

Against Corrosion

Cathodic protection against acid waters by means of a small mercury-arc rectifier is being tested by one operator who has much trouble with corrosion. He notes a definite decrease in pump-part replacements. Rubber paint is also known to be a retardent for corrosion of pump rods. Metallizing with stainless steel will also help in this problem.

The Surface Operation

Stripping by use of large wheeled scrapers and tractors has increased notably. Employment of "pusher" tractors during loading coupled with higher speed hauling units is an important step forward. The usual requirement is one pusher tractor for four or five scrapers. Some of the increased stripping ratio now noted is due to employment of such methods plus the fact that open cuts can furnish material so much more rapidly.

The "bull clam" shovel is making its appearance to handle dirt-moving jobs which require combined dozer and shovel service. These tools dig, carry, or float material as desired. One type embodies a dozer blade with toothed end plates and an overhead jaw which clamps down on material piled up by the dozer. The load can then be taken to another spot and spread as desired.

Skirts of washed cement bags proved useful to one operator in protecting screw-jacks from dirt which may foul

the screws. This idea has many applications in both open pit and underground.

On draglines, one operator has extended the fairlead well beyond the house to save wear of the drag rope over the bank edge.

Forty-ton payloads are being found "all in a day's work" in some open pits now converted to truck hauling. Many advantages can be listed for the large truck where applicable. First cost per-ton capacity is less for the larger trucks, as is also the steel requirement per-ton capacity. A desirable increase in ton-miles per gallon of fuel is noted as well as reduction in driver labor. The shovel-loading efficiency is improved, due to reduced spillage and a smaller amount of truck movements at shovel per tonnage unit. Larger trucks also move out more easily under load on soft, slippery, or irregular roads. Experience and accident records of one large Mesabi Range operator indicate a considerable increase in safe handling for the big trucks over the smaller.

Improvements in truck-body design continue. In the endeavor to reach greater simplification by eliminating built-in hoists, improved over-head hoists operated by remote control are being used. In one new type, two huge balanced hooks engage lift bars on the side door. The door then rises until in line with the hoist cable, after which it operates as a bail for raising body to dump position.

Extensive tests of butane-using truck motors up to 300-h.p. indicate excellent possibilities for increased life of motors and decreased cost of motor maintenance. Whereas ordinary internal-combustion engines require oil changes about every 80 hours, these engines show little deterioration of the lubricating oil even after 800 hours of use. The possibilities of employing such engines are being extensively explored by open-cut mine operators. These motors are being employed in some of the heavy-haul units which move 35- to 40-ton payloads up 10 percent grades at 8 miles per hour.

To provide greater protection when horns and whistles cannot be heard above the roar of operations, a back-up brake valve is now being used on some dump-truck jobs. This permits driver to travel in reverse and dump his load while standing on the running board. This auxiliary valve is placed outside the cab in reach of the right hand, so that the driver is able to see exactly where he is going when he is backing to dump.

Removable truck trays are being utilized for many duties. Man-hours and truck-hours can be saved by this flexible new idea in bulk-materials handling. A hydraulic hoist and frame are mounted on the truck chassis. The large truck tray is thus removable. It can be left for filling while its mate is in haulage. The operator also has available a combination flat-bed dump truck, hoist, and general-utility truck. Trays are picked up and other operations performed without the driver leaving the cab. Buckets or trays can either be set down flat or dumped as desired. The idea should find increased use in pits where hand loading is practiced.

Conveying and Piping

Novel application of the roller or pusher conveyor often seen in factories has been used successfully in loading for a tunnel-type quarry blast. These sectional roller devices aid in sliding the explosive and stemming quickly and smoothly into the tunnel chambers. Empty boxes are returned to be filled with stemming.

Makers of steel-corded conveyor belting have recently noted that on cross-country horizontal hauls, single-belt flights operating on centers up to 8 miles apart are possible. This may forecast appreciable savings in number of motors, takeups, controls, and supervision in large future installations.

Built-up wooden pipe in 5- to 8-sided sections is coming into use as a substitute for large metal or concrete pipe. When made of suitable woods, this needs no treatment, is sturdy and light in weight, and can be easily replaced later on in most instances when other materials are available. Scarcity of steel plate is being met by one company with a newly developed non-corrosive plastic roofing for oil tanks. Evaporation losses are also reduced.

A new type of pipe made of asbestos fiber and portland cement is useful, especially in water-supply and drainage systems. These smooth-walled pipes do not rust, have a high carrying capacity, are not subject to electrolysis or tuberculation troubles, and are easily coupled with small tools in the field.

Maintenance and Shop Work

The maker of mining machinery who has not issued some helpful bulletin on maintenance is rare. Many of the admonitions emphasize techniques which definitely pay off to conscientious workmen. Proper job set-up, well-analyzed cycle time, long-period production records, and many other supervisory maxims are now receiving consideration.

"Cold-casting" or electrical deposition of metal on worn pump rods and shafts now competes with welding and metal spraying. Though slower, the method does not distort or warp the work, produces a fine-grained, dense deposit, and makes a highly wear-resistant surface. The worn section is first machined and the surrounding area coated with wax or lacquer. The worn section is then cleaned, acid-etched, and plated to desired thickness. Grinding or machining is employed to finish. Chromium is the principal metal used.

A new pipe-bending machine for cold-bending without fillers has as its outstanding feature a spinner mandrel which completely fills the pipe and is rotated while bending is in progress. This prevents wrinkling or inside scars and loss of cross-sectional area. A new portable pipe bender utilizes hydraulic pressure. It produces smooth, even bends of any desired degree up to 180 in ⅜-in. to 3-in. pipe sizes. Pressure is applied with the pipe held against a properly selected "former."

Electromagnetic bases for portable air tools can aid in drilling and tapping places otherwise difficult to reach. Holding a drill frame firmly and evenly against the work results in greater accuracy, even when working at an angle. New welder's goggles are available with special new lenses possessing remarkable ray-absorptive powers, especially in the range where flux-flare normally obstructs clear vision. A welder can now see operations clearly from beginning to end.

N. E. (National Emergency) steels are recommended to the mining industry for current use. Operators are advised to first use carbon steel, if at all usable. If it is not usable, (1) carbon manganese steel (NE-1300 series), (2) Mn-Si-Cr-Ni-Mo steel (NE-9400 series), (3) Ni-Cr-Mo steel (NE-8600 series) are recommended in order of desirability from a national emergency standpoint. In general, the miner is admonished that, to get the most out of a piece of equipment, he must know what is happening; that is, know its proper use and abuse. Inspect, lubricate, adjust, replace, are some of the watchwords being repeated over and over again to supervisors, miners, and shop crews to keep alive the objective of making equipment do its utmost for the duration.

To insure the wearing of goggles where needed, goggle-cleaning stations are being introduced in some places so that the individual worker can keep his goggles clean. A wall-mounted case dispenses cleaning fluid and wiping tissue and has a receptacle for used tissues. In practice this should reduce eye strain by giving clearer vision.

3 War Accelerates Mineral-Dressing Development

R. SCHUHMANN, JR., *Department of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.*

MANY NEW mineral-dressing plants started operation during the second year of war, and construction was begun on many more. The new operations include heavy-medium (sink-and-float) plants treating base-metal, non-metallic, and iron ores, flotation plants for base-metal sulphide ores; flotation plants treating a variety of industrial minerals; wet-magnet plants for iron ores; gravity and flotation plants for tungsten ores; and chemical or metallurgical plants with important mineral-dressing steps. Some of the most important new developments will not be generally known or publicized until after the war.

Iron-ore concentration has attracted the attention of many mineral dressers. Concentrates produced by straight washing, heavy-media separation, jigging, magnetic separation, and differential grinding plus gravity concentration account for a steadily growing percentage of our iron production. Flotation is being investigated by several companies, and the secrecy regarding some of the results suggests that some degree of success is being achieved. A number of new laboratories have been built and others are planned for intensive investigation of iron-ore concentration in the immediate future.

Reduce Grinding Costs

Dr. H. A. White, in an article analysing the prospects of gold metallurgy (*Jnl. Chem. Met. Min. Soc. of S. Africa*, March-April, 1943), pointed out that the most promising avenue of improvement lies in a reduction in cost of fine grinding. He states further: "It is not the accumulation of more, and more carefully prepared, empirical data which will secure any very considerable advance in our knowledge of comminution problems. Rather what is required is a more intensive examination of the underlying laws involved and development of new ideas for the practical utilization of the possibilities thus revealed. Our present methods are wasteful of power, space, and wear of steel." Though Dr. White was mainly concerned with cyaniding of gold ores, his remarks apply with equal force to the future outlook for mineral dressing in general.

An extensive investigation of ball wear was reported by T. K. Prentice (*Jnl. Chem. Met. Min. Soc. of S. Africa*, Jan.-Feb. 1943). It was found that alloy steel balls containing 0.6 to 0.9 percent carbon and either 0.85 to 2.1 percent chromium or 2.5 percent manganese showed the highest wear resistance. The wear rates did not correlate with ball hardness, as some of the steels least resistant to wear had about the same hardness as some of the most resistant steels. On the basis of his own data on non-equilibrium wear rates, and the data of others on equilibrium ball charges, Prentice presented a good case for the theory that the rate of wear is proportional to the surface of the ball or to the square of the diameter. This is to be compared with the Davis formula, in which wear is proportional to ball weight or to the cube of the diameter, and also with Bond's intermediate result that wear is proportional to the 2.3 power of the diameter.

Closed-circuit wet grinding in the beneficiation of bauxite represents a departure from traditional practice. Grinding is carried out in the alkaline solution used to dissolve the alumina as sodium aluminate, so that the grinding and subsequent wet separation operations of the Bayer process roughly parallel the operations in the cyanide process for treating gold ores. Another large field in which closed-circuit wet grinding is displacing dry grinding, and in which this change has been accompanied by improvements in the processing subsequent to grinding, is cement manufacture.

Classifying and Sizing

The preparation of aggregate at large dams recently built deserves attention if for nothing but the quantities of material handled. Accurate grading, particularly of the fine aggregate, is an important factor in making uniform, high-quality concrete, and this has been accomplished by the use of screening and mechanical classification equipment long used in mills.

The Dorr Co. has announced a new hydraulic classifier, called the Hydrosizer. It is similar to the Fahrenwald sizer, but has improved automatic control of the spigot discharges. Instead of using the pressure in the hydraulic standpipe to lift the valve directly, the hydraulic standpipe is connected to a sensitive pressure instrument which controls the motor power used for lifting the valve. Besides the obvious application in gravity concentration, this classifier is proving useful in sizing molding sands and abrasives.

Centrifugal classification, using forces several hundred times gravity, continues to find more application, particularly in processing industrial minerals. In the new cement plant of Universal Atlas Cement Co., Northampton, Pa., Bird continuous centrifuges separate fine material, requiring flotation to raise the lime content, from coarser material not requiring concentration. The action of the Bird machine is analogous to that of a spiral-rake mechanical classifier. Pulp is fed to a conical bowl revolving about a horizontal axis. A pool of adjustable depth is maintained at the large-diameter end of the cone, which overflows the undersize. Coarser material settles on the inner surface of the cone and is conveyed toward the discharge at the small-diameter end of the cone by means of a spiral rake. As in a mechanical classifier, the pool does not extend to the sand discharge, so that a section of the cone serves for draining and dewatering. The spiral is mounted on an inner cone and is rotated by a special mechanism at a slightly different speed from the bowl; for example, when the bowl rotates at 400 r.p.m., the spiral may rotate at 393 r.p.m.

An excellent review of the whole field of centrifugal separation was given in *Chem. & Met. Eng.*, July, 1943.

Gravity Concentration

Heavy-media, sink-and-float plants were abundant among the year's new installations. Galena and ferrosilicon

IMPROVED FLOTATION MACHINE DESIGN is shown by these Fagergren cells, here floating sphalerite. "Stepped-down" cells at rear of first row contrast with new "level-type" cells in front and at left

remain the important media materials. The process is now used for preconcentration of zinc and lead-zinc ores in Tennessee, the Tri-State district, and Idaho; also for tin ores in Bolivia. New plants at Leadville (*E.&M.J.*, Sept. 1943) and at Osburn, Idaho, produce good grade "ore" from dumps and old tailings. One plant has just started operation on fluorspar and three other heavy-media plants concentrating fluorspar are expected to start operation shortly. Garnet and magnesite are other industrial minerals concentrated by heavy-density methods. Several plants have been in operation on the iron range in Minnesota and another iron-ore plant is due to go into operation in Texas during 1944.

Sink-and-Float Facts

A "Heavy-Density Symposium" featured the Milling Methods program of the A.I.M.E. in February of 1943. The papers presented at this meeting and later published in *Mining Technology* afford a good introduction to those not yet acquainted with the heavy-density processes. In an appendix to one of these papers (Swainson, Falconer, and Walker) are given detailed descriptions of apparatus and techniques for laboratory testing. Further information is available in Ore Dressing Notes Nos. 11 and 12 of the American Cyanamid Co., in a brochure of the Sink and Float Corp., and in a number of papers describing operating mills. (See *E. & M.J.*, Nov. 1943, Eagle-Picher's Central mill; *E. & M.J.*, Sept. 1943, Ore and Chemical Corp.'s. Leadville mill.) After going over the available material, the reader will realize that there is still room for development, particularly regarding the effects of currents of various kinds in the separator, variations in density from top to bottom of cone, medium viscosity, medium stability, and behavior of marginal density particles.

Ten mesh seems to be about the lower size limit of material satisfactorily treated by heavy-density processes, and in many operations the split is better made at somewhat coarser sizes ($\frac{3}{16}$ or $\frac{1}{4}$ in.). In concentrating iron ores, jigging has been used for the minus-$\frac{1}{4}$-in. material. More recently a process of double classification and screening has been developed. This seems to be essentially a rough concentration by sizing and sorting, with the sorting being carried out in a specially designed spiral-rake classifier equipped with water boxes. The process is controlled to maintain a high pulp density and high percentage of the heavy mineral in the special classifier, these conditions favoring the best separation by sizing and sorting as demonstrated by Professor Richards many years ago. The densities maintained are such that the action in this classifier is said to partake of the nature of heavy-media separations.

A Spiral Concentrator

A new gravity concentration device, the Humphreys Spiral, has attracted considerable attention (See *E. & M.J.*, Oct. 1943) for concentration in about the particle size range of tabling. Operating on marine black sands in Oregon, a 24-spiral unit treated 1,000 tons per day of sands containing 6 percent Cr_2O_3, giving a 25 percent Cr_2O_3 concentrate with a recovery of better than 90 percent.

Shaking-table designs, relatively unchanged for many years, have evidently been the object of recent investigation. Overstrom & Sons has announced a table with an 8 x 30-ft. deck, said to have the capacity of three or four standard tables. It is understood that other changes in table design are incubating. The question as to optimum table size is an interesting one, well worth study in view of the continued wide use of tabling. Some aspects of table operation suggest that capacities are proportional to the length of the edge discharging the

products; other aspects of tabling suggest that the capacities are closely related to the concentrating area; still other aspects suggest a close relationship between capacity and volume of solids on the table.

Flotation

Several new sulphide-flotation plants in this country became producers during 1943. No radical departures from previous practice have been evident. Morenci is installing additional equipment, and is expected to handle 50,000 tons per day by early 1944. Miami Copper Co.'s Castle Dome plant started operation; also Bagdad Copper Co. Vermont Copper Co., an old copper producer shut down for many years, started up again. Golden Cycle converted to lead-zinc flotation and is now treating several hundred tons per day of lead-zinc ores on a custom basis (including the sink product from the Ore & Chemical Co.'s heavy-media plant at Leadville).

Relatively little information was made public during 1943 regarding methods of floating industrial minerals, but the number of new plants and the variety of minerals floated suggest considerable technical progress. Among the old standbys for which new plants have been reported are cement, phosphate, and fluorspar. Additions to the family of industrial minerals commercially treated by flotation include spodumene, ilmenite, tungsten minerals, magnesite, talc, and chromite. Soap flotation with alkalis and sodium silicate as modifiers has been the backbone of the commercial flotation of the non-sulphides in the past, but other reagent possibilities, which have been under development in the laboratory for some time, are beginning to reach the payoff of commercial operation. Prominent in the latter group are the amines, the so-called cationic collectors. So far these have been prominent as silicate or silica floaters and in separating water-soluble minerals carried out in saturated brines.

There are many signs that the flotation of non-sulphide minerals is entering a new phase which might be termed the selective-flotation phase. That is, the emphasis on choice of collector is giving way to emphasis on choice of modifying agent, mostly inorganic chemicals, and pH control as a means of obtaining selectivity in the separation of similar minerals.

Flotation of iron ores is being investigated by several operating companies. Much test work has been aimed at floating the iron oxide and depressing the gangue, but this procedure is said to have given concentrates too high in silica. The alternative procedure, floating the silica from the iron, is attractive in that the least abundant mineral is floated, but results have not been publicized.

The Steffensen pneumatic flotation machine, recently put on the market by American Cyanamid Co., was developed at Bethlehem Steel Co.'s Lebanon plant for the flotation of chalcopyrite-magnetite middlings from a coarse heavy pulp of 20-mesh magnetite concentrate.

Several papers of a fundamental nature were presented at the February 1943 A.I.M.E. meeting. These papers served to give theorists their annual workout.

A study of collector coatings in soap flotation by Taggart and Arbiter brought out some phenomena which may have considerable significance in the control of soap-flotation separations. They showed that depression of various minerals can be accomplished in either acidic or basic pulps without removing the soap coating from the mineral surface. On the acid side, depression is explained by the formation of a second layer of oleic acid with carboxyl groups oriented outward from the mineral surface. Too high a concentration of soap also has a depressing effect, which may be explained in similar fashion. Nujol restored floatability in the presence of acid or excess soap. On the alkaline side, it is postulated that hydroxyl ions disarrange the soap layer in such a way as to reduce its water repellence.

It has been generally assumed that the cationic-collector ions (such as the lauryl ammonium ion, $C_{12}H_{25}NH_3^+$) act on mineral surfaces in the same way as the anionic-collector ions (such as the xanthate ion), except that they exchange with cations from the mineral surface instead of with anions. However, Arbiter, Kellogg, and Taggart obtained data which they interpret as showing that the collection of metals and metal sulphides in alkaline pulps involves attachment of the free amine (that is, $C_{12}H_{25}NH_2$) directly to the metal ions in the solid rather than attachment of the amine ion ($C_{12}H_{25}NH_3^+$) to the anion of the solid.

S. C. Sun reported a mass of data correlating slime coating phenomena with cataphoretic measurements. Using a modified Mattson cataphoretic cell, Sun was able to eliminate difficulties and discrepancies previously associated with the cataphoretic measurements. His own data and those of previous slime-coating students were simply correlated by a hypothesis taking into account the signs and magnitudes of the ionic charges on particle and slime.

Magnetic Separation

Wet magnetic separation is the major process at the newly developed magnetite properties in the Adirondacks. Production of high-grade magnetite sinters in this area is expected to reach soon about 4,000,000 tons annually from 11,000,000 tons of ore. Wet-belt-type separators such as the Crockett type K are commonly used. Present practice at these plants also involves some concentration of coarse sizes with magnetic pulleys.

Another important application of wet magnets is in the cleaning of ferrosilicon media in heavy-media separation processes.

The Steffensen magnetic separator is a new wet separator of the revolving drum type.

Automatic Control

A feature of recently built chemical plants is the high development of automatic controls. Within a relatively short time there has been developed an organized body of knowledge and principles so that process control almost promises to become a new branch of engineering. In many processes, the early attempts at automatic control ran into difficulties because of the time lag in response of the system to control—a common result was oscillation of conditions in the system between intolerably wide limits instead of the desired steady operation. Now, however, controls have been developed which take the various kinds of time lags into account in a quantitative manner. (For a general survey, see *Chem. and Met. Engineering*, May 1943.)

Taking stock briefly, a surprising number of automatic controls are in use in mineral-dressing operations, and there seems to be a definite trend toward further development of control devices. A few of the most familiar are: constant-weight feeders, pulp-density controllers, the Hardinge electric ear, controls based on motor loads in classifiers or ball mills, jig bed controls (on coal jigs particularly), and automatic spigot discharges on classifiers. An electrical system used in Utah Copper Co. mills for maintaining full-capacity operation in a rolls crushing circuit was described in the July 1943 *E. & M.J.* (p. 86).

An application of potentially great importance is automatic pH control of flotation pulps. This is a field in which some of the newer principles of control should prove valuable. Another promising field is the control of separation conditions in heavy-medium processes.

4 Iron-Ore Beneficiation May Depend on Flotation

E. W. DAVIS, *Director, Mines Experiment Station, University of Minnesota, Minneapolis, Minn.*

As the older operating mines of the Lake Superior district approach exhaustion, new properties are being stripped and new shafts sunk, so that production can be maintained at any rate required by the steel industry. The use of trucks, conveyor belts, and other bulk-handling equipment has made possible the open-pit operation of some properties previously classified as underground mines, and other properties that had been abandoned because of high production costs are now being put into operation with more modern equipment. Drilling and exploration are active, especially in Michigan.

A High-Cost Instance

Perhaps the most interesting and spectacular development is the opening of the Embarrass mine, near Biwabik, toward the eastern end of the Mesabi. Here the iron formation is crossed by a chain of lakes, and a large deposit of high-grade ore lies under and adjacent to one of them. Before the lake could be drained, it was necessary to divert the flow of water around the property through a mile-long diversion channel. Stripping around the lake has been progressing all summer, and it is now being pumped out. This property, estimated to contain 20 million tons of direct-shipping ore, will enter the shipping list next summer.

The average analysis of the iron ore shipped from the Lake Superior district is about 51.5 percent Fe and 8.0 percent SiO_2. This average has remained practically constant for many years and indicates the average grade of ore desired by the blast-furnace operators. Ores of various grades are shipped from the different properties on the ranges, and these are mixed at the ore docks and in the furnace yards to produce furnace burdens of about the analysis detailed in the foregoing. If the ore available to any particular smelting company is low in silica—that is, below 8 percent—it is a simple matter to secure high-silica ore to mix with it, but if only high-silica ore is available, the situation is more serious, because development of new sources of low-silica ore is becoming more difficult.

It will probably be a surprise to many to know that most of the concentration plants on the ranges produce high-silica ore and that most of the low-silica ore comes from the direct-shipping mines, principally the Mesabi open pits. Some figures assembled a few years ago showed that the concentrates being shipped averaged about 12.5 percent SiO_2 and the direct ore from some of the larger open-pit mines averaged about 6.5 percent SiO_2. In 1942 nearly 18 million tons of concentrates were shipped from 35 plants, principally on the Mesabi range. When many of these plants were built they produced low-silica concentrate, but as mining progressed the simpler concentrating ores which contained only fine silica that could readily be washed away gradually gave place to ores containing coarser silica.

Cutting Down the Silica

Crushing was found to aid in the removal of silica, and the crude ore was first crushed to 4 in., then 2 in., and now ¾ in. in some plants. Scalping screens and classifiers were introduced and then jigs were added to some of the washing plants. More recently heavy-density separation has been developed for the coarser ore, the finer material being jigged or classified. However, the improvement in concentrating practice has hardly kept pace with the loss of desirable concentrate characteristics in the remaining ore, with the result that the concentrate being shipped remains quite high in silica. Considerable improvement in iron recoveries has been made, and still greater improvements are to be expected, but there is little indication that concentrates materially lower in silica than those now being shipped are to be expected unless radical changes are made in existing plant flowsheets.

Most of the mining companies now have experienced metallurgists and ore-dressing engineers on their staffs, and several have recently established research organizations and constructed laboratories or provided large-scale test equipment. The tonnage of ore of the type now being concentrated is probably not large, and for this reason much research work is now being done by the mining companies themselves and by several independent laboratories looking forward to the time when it will be necessary to utilize the immense tonnages of taconite that are available in the Lake Superior district.

Taconite is the low-grade iron formation assaying about 30 percent Fe that is associated in large quantities with the better grades of ore on most of the Lake Superior ranges. It is found in the form of hard, massive rock in which the iron-bearing minerals are finely disseminated. The rock must be ground to 100 mesh or finer before the iron minerals are sufficiently free for concentration, and none of the existing concentration plants can treat this type of material. The various laboratories and research organizations that are studying the concentration of taconite are attempting to produce low-silica concentrate because it is believed that all of the remaining low-silica direct-shipping ore will be needed for mixing with the high-silica concentrates produced by existing plants and that the new taconite concentrators must stand on their own feet.

Treating the Taconite

In general, there are two kinds of taconite: that in which the iron-bearing mineral is principally magnetite and that in which the principal iron-bearing mineral is hematite, more or less hydrated. If the iron exists as magnetite, magnetic concentration equipment and processes now in commercial use can, with some modifications, be utilized to produce low-silica concentrate; but if the iron exists as hematite, concentration procedure is more obscure. It so happens that the taconite most readily available in the walls and bottoms of existing mines is of the oxidized type, and this material is being most carefully studied at present.

The two processes receiving the most attention are magnetic roasting and flotation. The oxidized taconite

can be roasted, converted to magnetite, and then concentrated magnetically, but because this is an expensive process, flotation is receiving more attention. It is possible to float either the silica or the iron oxide, but neither operation appears to be simple. Taconite contains a little more silica than iron minerals, but the iron minerals vary from hard hematite to soft, highly hydrated limonite, together with some iron carbonate, and it may develop that flotation of the silica will be a simpler and cheaper operation than the flotation of the iron minerals.

For many years washing and jigging plants have been discharging fine tailings into great tailings basins, particularly on the western Mesabi. There is a certain amount of natural classification in these basins, and the possibility of further concentrating the best portions of these deposits has been studied. It is possible, by classification methods, to produce a fair grade of concentrate from some of this material, and this is actually being done at one property. However, the flotation experts are able to produce low-silica concentrate from current tailing as well as from the old tailings in the ponds, and it may happen that flotation will first appear in the Lake Superior iron-mining districts as an adjunct to washing and jigging plants. The concentrate that will be produced will be very fine, and when any considerable quantity of it is available, sintering will be necessary.

Though iron-ore concentration in the Lake Superior district has been almost entirely a Minnesota project in the past, Michigan and Wisconsin operators are now carefully investigating their reserves with the idea of developing concentrating ores. In some instances these investigations are very active, and it is to be expected that before long these states will enter the concentrate shipping list along with Minnesota.

5 Copper Smelting Pace Curbs Changes

ETTORE A. PERETTI, *Assistant Professor of Metallurgy, Columbia University, New York*

MOST COPPER SMELTERS report that they were kept so busy producing metal at maximum rate in the past year that they had little opportunity for improving practice. Some plants were forced to operate below capacity due to a shortage of men for mining work.

According to R. A. Wagstaff, the A.S.&R. company has been able to increase the copper-lead ratio of both speiss and matte in handling copper in the lead plants. This was accomplished by use of a soda-ash treatment in smelting the lead drosses. The method has done away with the formation of all slags and is unusually well suited for lead plants where little speiss is formed and the copper content of the charge is high. The increase in grade of copper concentrates has made direct-smelting more attractive. Also, studies are being made to increase tonnages by improvements in combustion and furnace design.

At Hudson Bay's Flin Flon plant, according to J. H. Ambrose and W. A. Green, the tonnage of pay charge treated and the amount of copper produced will be higher than for any previous year. In addition to handling all available tonnage of concentrates through the roasters and reverberatory furnace, selected high-grade ore from the mine was smelted direct in the converters. The practice of running reverberatory matte through launders to a ladle in the converter aisle has been discontinued. This was improved by blasting out a tunnel alongside the furnace and installing a track so that a ladle could be run close to the tap-holes for tapping the matte. By installing suitable hoods and a 38,000-cfm. ventilating fan, matte-tapping has been made practically gas-free.

Preheating Roaster Air

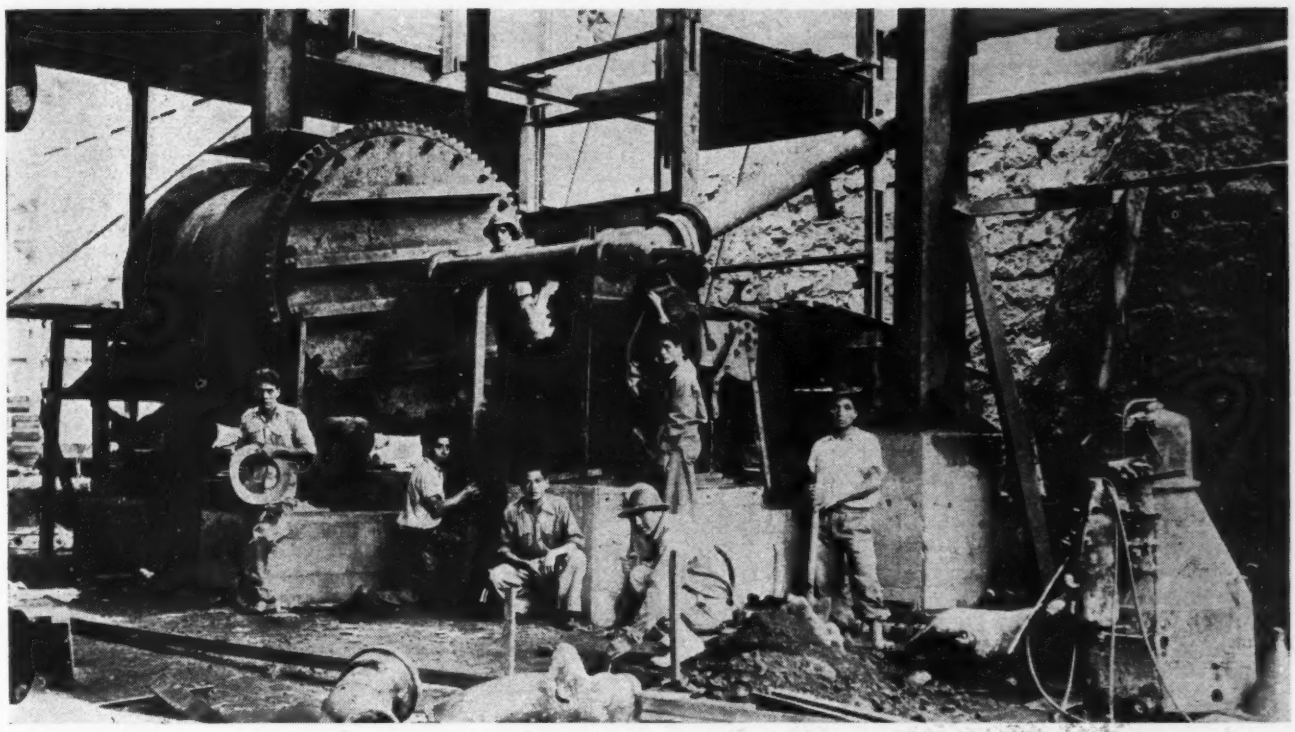
The scheme of piping the arm- and column-cooling air discharged to the inlet of an electric air preheater and thence into the roaster as preheated combustion air, as described in last year's review (*E.&M.J.*, Feb., 1943, pp. 102), has been so successful that the other four roasters are being similarly equipped.

To conserve heat in the roaster gases for efficient operation of the Cottrell plant and to lessen the chances for corrosion, the new steel roaster flue has been fitted with about one inch of plastic insulation. The dust that settles in this flue was formerly collected in a tank, from which it was conveyed back to the roasters pneumatically. The scheme was troublesome owing to the difficulty of screening out lumps of dust, and a screw conveyor was installed under the flue to remove the dust to a hopper, from which it is hauled to the furnace in cars.

A record of Soviet Russian converter-lining practice with a discussion of reasons for failure of lining material appeared in an article by A. A. Babadzhan, published in *Tsvetnye Metal* 15, 66–75, 1940.

The demand for refined copper gave rise to a supplementary "black-copper" program conducted by W.P.B. with the Metals Reserve Co. Smelters having available furnace capacity purchase copper-base scrap on a copper-content basis for Metals Reserve account and smelt it to black copper, and sometimes to blister. A symposium on Secondary Metals was held under the auspices of the Institute of Metals Division during the annual A.I.M.E. meeting in February, 1943. The scrap copper situation was discussed by F. H. Wright and G. L. Craig. The latter deals with the methods used commercially for making copper-clad materials, followed by an outline of the metallurgical processes proposed to recover the copper from clad-steel scrap. These are: direct melting, molten lead-bath treatment, electrochemical processes, scaling, sulphide scaling, ammonium sulphate leaching, and cupric ammonium carbonate leaching.

According to F. W. Willard, in *Metals and Alloys* for April, 1943,



CONVERTER of Cotopaxi Exploration Co.'s small plant in Ecuador has a daily capacity of 20 tons of blister, turned out by this Peirce-Smith-type unit. It has completed its first full year

copper and copper-base scrap are treated as follows: No. 1 scrap (99 percent Cu) is used in place of refined primary by foundries and brass-ingot makers in copper-base alloys or is fire-refined in reverberatories to meet electrolytic standard under A.S.T.M. B–5–27, or may be pre-refined to make a foundry grade of copper of 99.5 percent or better.

Scrap containing 92 to 98.5 percent Cu is treated similar to No. 1 scrap. Byproducts of these operations are usually furnace slags that may contain as much as 50 percent Cu with appreciable amounts of tin and lead. They normally go toward the production of black copper or blister, with subsequent electrolytic refining. Skillful treatment of these slags in the blast furnace with other scrap can produce a copper-base alloy which can be used directly to make standard red-brass foundry alloy.

Scrap containing 5 to 6 percent copper normally goes to the blast furnace or converter before further refining. Red-brass scrap largely goes to the secondary smelter, where it is remelted and refined to standard specifications in a reverberatory. Byproduct slag goes to a blast furnace. Yellow-brass scrap is remelted and brought up to grade to produce the commercial No. 1 yellow ingot for general brass-foundry use. Market conditions may divert appreciable quantities of this scrap to the primary smelter. Nickel silver is ordinarily treated the same as yellow brass. Some nickel recovery is made in the form of nickel salts from the electrolytic copper refinery solutions.

The Cotopaxi Exploration Co. now has a self-contained unit smelting 20 tons of blister per day (*E.&M.J.*, Dec. 1943). The ore contains 4 percent Cu, 0.4 oz. Au, and 2.5 oz. Ag per ton. The plant is in Ecuador.

6 Lead Metallurgy Aided by Advanced Techniques

G. L. OLDRIGHT, *Senior Non-ferrous Metallurgist, Bureau of Mines, Rolla, Mo.*

ALL LEAD METALLURGISTS will remember 1943 as a war year; high production had to be maintained in the face of supply difficulties and labor shortages, all under the regulations of a wartime economy. Lead, however, has accumulated, largely due to importations from abroad. To many metallurgists, 1943 was memorable for the better adaptation of lead to many uses: the dry-charging of batteries for shipment and reassemblage abroad, the use of lead as a protective coating for steel, for "lubricating" projectiles, and for use with silver and other met-

SCOTCH-HEARTH SMELTING plays its part in Eagle-Picher's plant at Galena, Kan. Here one of the eight mechanically rabbled and backed Newnam hearths is seen in operation in this versatile reduction works. A 12-ft. completely mechanized hearth is at present under construction.

als in minor percentage to take the place of tin in bearings.

Some of the larger producers of lead concentrates, from ores of simpler types in particular, have sought to simplify their concentrator flowsheets without too great a loss of lead, as in the case of American Zinc, at Mascot, Tenn.; Eagle-Picher in Oklahoma, and in the Coeur d'Alenes. The new high-density medium plant at Leadville, using ferrosilicon, is making a low-grade zinc-lead-copper concentrate containing some precious metals from dumps. "St. Joe" keeps a careful eye on the proper preparation of feed for tables. Feed is stage-ground and classified in order to give the tables specific products, non-slimed feed is produced by controlling pulp density in the ball mills to minimize overgrinding. With this comparatively coarse ore, flotation is used at the end of the flowsheet as a scavenger operation. Pointing to the possibility of more intimate mineralogical associations in the future, although only galena has present economic importance, six other valuable minerals tend to concentrate in flotation and table middlings. (Some lead-copper-nickel-cobalt matte is now being shipped from the company's smelter.) The flotation concentrates are dried in a rotary kiln before they are shipped to the smelter. Table concentrates are similarly dried or may be filtered before being shipped to the Scotch hearth plant at Alton, where smelting capacity was recently increased.

The lead-silver-zinc ore at Peñoles is being ground to avoid loss in slime, although the grind is finer. A rod mill is once more being used as the primary grinding unit, lead middlings are tabled, and lead is floated between the two stages of grinding. Most of the new and old concentraters reporting from the Rocky Mountain region treat complex ores by fine grinding and flotation. Improvement is largely in flotation circuits (including grinding) to permit sharper separation of sulphides. At San Francisco del Oro, chalcopyrite is floated from galena and sphalerite, following bulk flotation of the three minerals. Concentrators were reported as starting at Osburn, Idaho, Pioche, Nev., and San Xavier, Ariz. That at the Rico Argentine has been rejuvenated. Taxco, in Mexico, is already an important shipper of concentrates.

One comprehensive survey of the over-all operation of a modern company treating and making lead products was given during the year: that of the Eagle-Picher, in *E.&M.J.* for November. Smelting and part of the pigment manufacture were covered in a separate section. Those interested in the possibilities and methods of producing and treating a series of galena concentrates of varying grade will find produced in one plant: galena, treated until it is almost chemically pure to serve for making pigments; slightly lower-grade lead products for the Scotch hearth; and still poorer products for the D. & L. blast-furnace unit. Sulphur is roasted from lead both by flash-roasting and on the D. & L. A 12-ft. completely mechanized Scotch hearth is now being constructed.

More smelters are receiving zinc-leaching or volatilization plant residues as a part of their charges. Some smelters had to use still larger amounts of iron ores, to take care of the zinc; others have been nearer to sources of light or inferior iron scrap, including some from war operations. The trend to use more lime in the charge also continued, with its commitment of making sinter containing little sulphur. Those employing less scrap iron in blast furnaces usually found it necessary to use more coke with a consequent decrease in speed of smelting. Plants without elaborate overhead bin systems, in particular, are storing more of their smelter products in piles on flat surfaces and are transferring their materials with motorized equipment designed for coal or gravel.

Use of a water seal for the D. & L. was found useful at a smelter not only to prevent air leakage but also in handling windbox lead. A D. & L. sintering plant finds it possible, by recirculating the dilute SO_2 gases from the last windboxes back through the first boxes, to make SO_2 gas sufficiently rich for commercial manufacture of sulphuric acid. Another smelter has been making elemental sulphur in commercial quantities by reduction with natural gas.

Many smelters have found that "final sinter" on being stored will lose the structure that makes for rapid smelting. D. & L. machines are now usually operated at nearer full capacity than any unit in the smelter, faster smelting sinter is being made, and fewer blast furnaces are needed. Many plants have unused blast furnaces. One smelter has found that the sintering machines can be operated most steadily and the stock bins kept lower, by making and storing the more weather-resistant "first-over" sinter. To make easier the usually arduous job of "barring down" accretions in an operating furnace, it may be run several months without much barring being done. Then a spare blast furnace may be put into operation, and the old furnace cleaned out when it is nearly cold. The innovation of sintering gray slag (Nov., 1943, *E.&M.J.*, cit.) in a single pass at Galena was observed to make the material smelt more rapidly, and to need less barring.

The Bunker Hill smelter's new plant for volatilizing zinc and lead from blast-furnace slags was described in detail in the October *Mining Congress Journal*. Comparisons with other operating plants are made. In all of these plants, powdered coal is blown through a molten bath. Some cold slag may be added as well as the current molten blast-furnace slag, but such additions decrease the tonnage that may be smelted. In contrast to European practice, Waelz kilns in America are largely used for treating other solid zinkiferous products, such as zinc retort plant residues, although some cold slags have been treated; the slags and residues have many similar components. In some European plants, residual products contain more lead per unit of zinc, and furnaces of other types have been used to "clean up" the lead.

Fume Re-treatment

Recovery of the lead from zinky fume would seldom be attractive for the lead content alone in American practice: the main objective is usually to make a superior zinc product—e.g., one that is more dense and lead-free. There is little cadmium to pay for retreating fume made from lead blast slags; halides, etc., however, are removed to make the re-treated product more acceptable to electrolytic as well as to retort plants. The fume from D. & L. sintering plants and from blast-furnace baghouses is now being treated for its cadmium content at many plants, or the fumes are sold.

Lead plants with copper converters available were among the last to install separate drossing furnaces for treating lead bullion, particularly for increasing the units of copper per unit of lead in the dross to be sent to the copper plant. By modifying their drossing operation, including the use of soda ash, several plants have greatly improved their practice, obtaining products containing, for example, 60 percent copper to 8 of lead instead of about 2 parts to 1 as formerly. An unusual feature in removing copper at Galena, Kan., is the combined use of caustic with sulphur for this operation; it was found that in the absence of antimony, the use of sulphur alone was not effective in removing the small amount of copper present. The practice of casting "rough-drossed lead" in large blocks before shipping to refineries seems to be growing.

An American plant is reported to be trying Port Pirie's practice of continuous softening. With the restrictions on the use of magnesium being eased, an increase is likely in the use of magnesium with calcium to remove bismuth. There was little new reported outside of patent references on the use of calcium carbide and other methods to form lead-calcium alloys containing 2 or 3 percent calcium.

A special "secondary-metals symposium" was issued in October by the A.I.M.E. Metallurgy of lead and tin was covered separately. Much work is being done to isolate each variety of scrap by itself and to classify it according to large-volume uses so that it may be reclaimed and returned to a specific use with the minimum of readjustment of constituents. Also, permissible standards of variation are needed.

Alloys that are difficult to classify or are of small usage are worked back to one or to a few components. Selective air oxidation was the cheapest way of removing many impurities. Steam in the presence of caustic oxidizes tin and arsenic but not antimony or lead. The uses of chlorine and caustic are familiar; and use of reagent metals to give removable intermetallic compounds was noted. When valuable metals such as tin are present it may be permissible to use more expensive "reagent metals."

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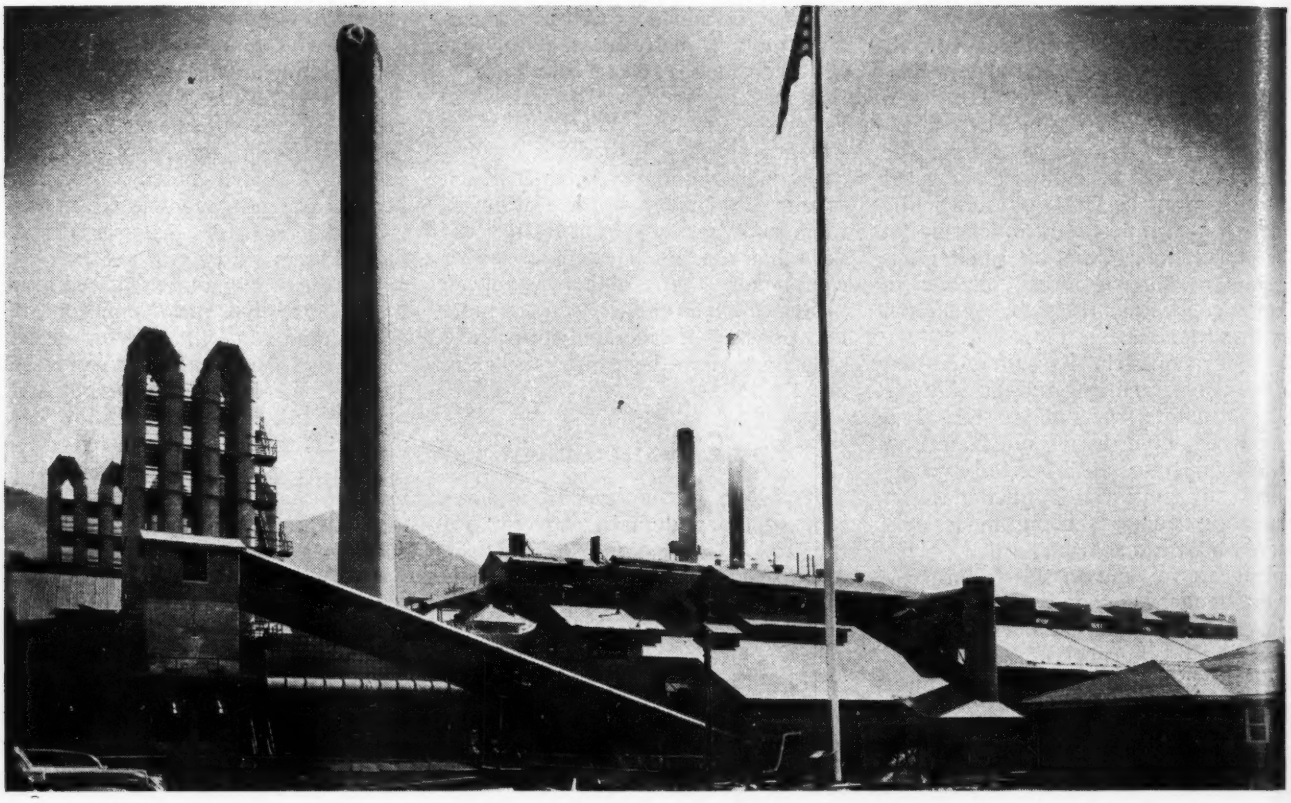
7 New Roasting Techniques Improve Zinc Metallurgy

H. R. HANLEY, *Professor of Metallurgical Engineering, Missouri School of Mines and Metallurgy, Rolla, Mo.*

ACTIVITIES IN ZINC METALLURGY during 1943 were directed to the milling of larger tonnages of low grade zinc ore; the winning of zinc and other metals chemically locked in slag; the enlargement of operating reduction plants; increasing output of high-purity metal, both by direct production and by refining; and the increasing production of byproducts. These efforts resulted in noteworthy contributions to metallurgy at a time when shortage of manpower and equipment severely handicapped operations.

The effect of heavy-density separa-



RECOVERING ZINC from about 400 tons of lead blast-furnace slag daily, Bunker Hill & Sullivan's new zinc fuming plant (left of stack) exemplifies the best modern practice of automatic instrument control

tion processes has been to make possible the production of zinc concentrates, and ultimately metallic zinc, which otherwise would not have appeared in production statistics. These processes have treated large tonnages of low-grade ore as an initial conditioning step to provide suitable feed for older milling processes. New production from old dumps in the Leadville, Coeur d'Alene, and Tri-State districts has notably augmented metals producton.

Slag Fuming Profitable

Extraction of zinc from lead blast-furnace slags has been an additional source of zinc at two plants, the Bunker Hill & Sullivan Mining & Concentrating Co. at Kellogg, Idaho, and the International Smelting & Refining Co. at Tooele, Utah. This process recovers the zinc in the current molten slag and renders available zinc in large slag dumps that have accumulated over the past quarter century. Although the primary product is zinc oxide, contaminated with lead and other volatile constituents of the slag, it may be processed for metallic zinc or deleaded to produce salable oxide.

As a byproduct in refining the leaded oxide product, germanium and indium are conserved and subsequently refined. Indium is in demand for corrosion-resistant alloy bearings and other uses.

The slag-fuming process involves the introduction of powdered coal into the slag bath with a deficiency of air for complete combustion. Zinc compounds are chiefly reduced by the carbon monoxide bubbles, although the initial reduction may be caused by the solid carbon. Because the temperature of the reaction is above the boiling point of zinc, vapor is the primary phase produced. This oxidizes upon contact with the atmosphere and is drawn off through a flue system of dust collectors and coolers, terminating in a baghouse for the collection of the oxide. After densifying and de-leading, the oxide is treated in either a retort or an electrolytic plant.

The Bunker Hill fuming furnace has a batch capacity of approximately 35 tons of molten slag, and requires about 1¾ hours of blowing time to oxidize and remove the zinc and lead. Total time consumed per batch is approximately 2½ hours. The coal is pulverized in mills under pressure and fed directly at the same pressure into the slag bath.

The de-leaded zinc oxide at Bunker Hill, assaying approximately 72 percent Zn, is shipped to a retort zinc plant for reduction. This method of disposal, in place of electrolytic treatment, avoids the difficulty of purifying the oxide in order to provide a suitable electrolytic feed.

There has been a sustained effort to remove cadmium and lead from concentrates by sintering with salt on the Dwight-Lloyd machine; the gas stream from the machine after de-dusting is treated in a Cottrell operated at low temperature. This effort has a two-fold purpose: recovery of the valuable cadmium in a product suitable for processing into metallic cadmium, and the production of purified zinc which is suitable for die-casting or other specialized uses.

D. & L. Improvements Help

Changes in design of the D.&L. machine, distribution and sizing of the charge, depth of bed, speed of travel, and other operating factors permit the production of rich sulphur dioxide therefrom for the manufacture of sulphuric acid.

Desulphurization by shower or flash roasting is increasing where conditions are favorable. Finely divided concentrate (−100 mesh) is a prerequisite for this process, which produces high SO_2 concentration of the gas stream and low sulphide sulphur calcine.

At the Fairmont City plant, the American Zinc Co. of Illinois completed and put into operation a flash roaster and contact acid plant early in

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1943. These units have been operating satisfactorily, and their rated capacity, which has not quite been obtained, is 120 tons daily of 40 percent oleum, used in ordnance plants. The new Waelz installation at this plant for the treatment of electrolytic leach residues has been completed and is in operation.

At Mascot, the American Zinc Co. of Tennessee opened a fourth mine. This is known as the Athletic mine and is a small producer of relatively high-grade ore.

No new additions have been made to the Dumas, Tex., plant of this company. The improvements and enlargements of 1942 were completed by the beginning of 1943, and because of severe labor shortage operation of the plant did not reach full capacity.

The vertical fractionating column method of the New Jersey Zinc Co. has continued to play a major part in the refining of lower grades of zinc into special high grades for the manufacture of cartridge brass and die-cast munitions requiring large tonnage of pure metal for the alloy component.

A rotary kiln and baghouse have been installed at the Langeloth plant of the American Metal Co. for recovering zinc from the retort residues. This was in operation during the last quarter of the year.

At the Blackwell plant of this company, one Ropp roasting kiln has been added and additional drying space provided in the pottery department. These installations have been completed and operations conducted at capacity in spite of a decrease in the number of skilled workers available.

Production of concentrates from the Wisconsin district in 1943 will amount to approximately 3½ times that of 1942. This increase in production was made possible by high war prices for zinc, and by increase of the Vinegar Hill Zinc Co.'s central custom mill at Cuba City, Wis.

Federal Mining & Smelting Co. decided not to rebuild the Gordon Central mill in the Tri-State which was destroyed by fire March 7. The company has maintained production by using idle mill capacity in this district and is milling ores from its Oklahoma mines at the Eagle-Picher Mining & Smelting Co., Oklahoma mills.

The significant factors in zinc metallurgy in 1943 were as follows: application of heavy-density separation processes to mine products, if feasible; effective utilization of existing milling and retort facilities, each being augmented by new construction; the winning of zinc from slag in increasing amount; purification of zinc concentrates by salt sintering; and refining of ordinary grades of zinc by reflux fractionating.

8 Production Problems Face Ferro-Alloy Metallurgists

F. W. HORTON, *Senior Mining Engineer, Eastern Region, Bureau of Mines, College Park, Md.*

DEVELOPMENTS in the technology of the ferro-alloy metals during 1943 were confined largely to streamlining production methods to meet increased war demands, to beneficiating low-grade ores, and to adapting processes to lower-grade materials without impairing products. Because of the magnitude of the demand for ferro-alloys, research to satisfy it was often mandatory, and in instances resulted in complete abandonment of empirical methods of production for those based on scientific studies. Although there were no startling or outstanding innovations in the technology of the ferro-alloys during the year, many improvements were made in established processes. Most of these cannot be described here, as the ferro-alloy field is highly competitive; also the knowledge might assist the enemy.

Few not intimately associated with the steel industry realize that the special steels now being made in such huge quantities are far superior to those of the first World War and that specifications for ferro-alloys are more exacting than ever. Ferro-alloy manufacturers have in general faced the problem of making quality products from poorer ores, and successfully.

Boron

During the last twelve months boron gained an assured place in alloy-steel manufacture, but there is still much to be learned regarding its action of increasing hardenability and its secondary effects in steel. Two opposite viewpoints persist: Some metallurgists consider it simply as an alloying ingredient which, used in unusually small proportions, produces optimum results; whereas others see it solely as a processing element. Which view is correct remains to be proved, but it is definitely known that boron, added to an alloy steel in proper manner and quantity, will increase hardenability notably and produce beneficial secondary effects. Why this remarkable fact was not discovered years ago probably was that no one dreamed of using such minute percentages as are required and that more than 0.005 percent of boron causes hot-shortness. Development of the use of boron has been handicapped by the difficulty of determining accurately the extremely small quantities remaining in steel, but a method developed by T. R. Cunningham (Electro Metallurgical Co.) has solved the problem. The affinity of boron for oxygen complicates predetermination of the quantity of boron that will remain in a steel after a calculated addition of ferro-boron or one of the various complex deoxidizers or so-called intensifiers containing boron that are now on the market, but this can be gaged by experience.

The hardenability produced by boron varies greatly with the type of steel; the metal is far more effective in high-manganese and alloy steels than in plain carbon steels, especially low-carbon steels. Besides producing hardenability, boron seems to inhibit

the formation of ferrite on tempering and thus increases the toughness of steel, as do molybdenum, nickel, and vanadium. Hence, optimum mechanical properties are imparted by boron to steels which are heat-treated to high hardness. It is also claimed that in fine-grained steels boron improves machinability.

Chromium

Early in the year the ferrochromium manufacturers by mutual agreement reduced the specifications of standard ferrochromium to 60 to 63 percent Cr, 6 to 8 percent C, and 4 to 6 percent Si to permit using some low-grade ore. Occasional deficiencies in the supply of foreign ore with high chrome-iron ratios led, in some instances, to mixing domestic chromite with imported high-grade concentrates for making ferrochromium. Much attention was given to methods of treating domestic ores to raise their chromium-iron ratios. Investigations by the Bureau of Mines proved that a wide variety of low-grade domestic chromite concentrates can be roasted with carbon to reduce selectively most of the contained iron, which then may be removed by leaching with dilute H_2SO_4. The residue has an even higher chrome-iron ratio than required for the manufacture of standard ferrochromium.

Another solution of the problem of introducing the chromium of low-grade ores into steel is offered by Chrom-X, either as a powder or in briquets. This product is exothermic in its reaction and does not present the objection of adding too much cold metal to the steel as is the case with low-grade ferrochromium. The use of Chrom-X increased notably during the year; over 21,000 tons of chromite ore from Benbow, Mont., was shipped to the Chromium Mining & Smelting Corp. at Sault St. Marie, Ontario, to supply a part of the chromite requirements for manufacture of the product.

Because of the accumulation of stockpiles of domestic chromite and the lessened menace to our shipping, operations at two large chromite mills of Defense Plant Corp. at Benbow and Mouat, Mont., were suspended on June 20 and Nov. 1, respectively, and the plants placed in standby condition. The Benbow plant has a daily capacity of 1,000 or more tons of ore and that at Mouat can handle over 3,000 tons. Mill heads at these plants averaged approximately 19 percent Cr_2O_3. Concentrates contained 40 to 41.5 percent Cr_2O_3 and had a chromium-iron ratio of 1.6 to 1.

The marine black sand deposits of Coos County, Oreg., became a source of chromite concentrates in April, 1943, when Krome Corp. began production at its 1,500-ton plant near Coquille. Mill heads averaging 6 percent Cr_2O_3 were converted into a rough concentrate on 8x30-foot Overstrom tables (thought to be the largest in the world) and were then cleaned roughly by flotation. The final product, containing about 25 percent Cr_2O_3, was shipped 9 miles to the 300-ton mill of Defense Plant Corp.

Crude chromite concentrate was also produced by Humphreys Gold Corp. near Bandon, Oreg., from old tailings of the Pioneer and Eagle beach gold placers. These were concentrated in a novel cast-iron spiral launder with no moving parts; separation was effected by centrifugal force as the feed swirled down the launder, concentrate and middling being bled through holes in the launder bottom. The plant could concentrate 1,000 tons of sand a day. The sand averaged 6 percent Cr_2O_3, and the pulp fed to the launders contained 7 to 10 percent solids. The concentrates contained approximately 25 percent Cr_2O_3, and recovery was over 90 percent. The concentrates were trucked to the Defense Plant Corp. mill near Coquille, where the various components of the crude concentrate (magnetite, ilmenite, chromite, garnet, and zircon) were separated by magnetic separators, supplemented by flotation to remove garnet from the chromite and tabling to make a high-grade zircon product. Approximately 80,000 tons of crude chromite concentrate containing 25 percent Cr_2O_3 was purchased by this plant during the year, part of which was converted into a product containing over 40 percent Cr_2O_3 with a chrome-iron ratio of 1.45 to 1. All of the product was stockpiled. All three plants are now shut down.

Cobalt

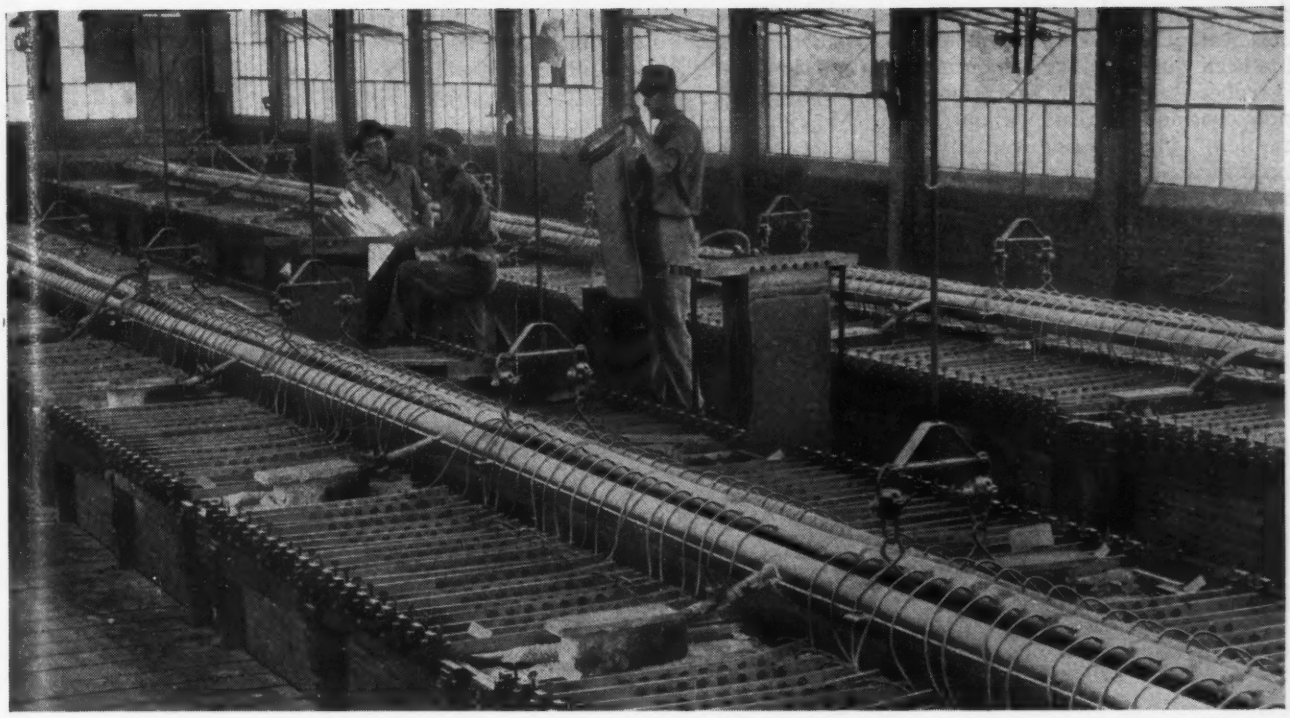
The Bethlehem Steel Co. continued to recover the cobalt from the pyrite at its iron mine at Cornwall, Pa. The ore, containing a little less than 1 lb. of cobalt per ton, is separated magnetically to yield a magnetite concentrate and a non-magnetic reject; the latter amounts to 36 percent of the ore and contains 5.6 percent pyrite and 0.086 percent cobalt. The reject is treated by selective flotation to produce pyrite and chalcopyrite concentrates that represent 5.92 and 1.58 percent of the heads, respectively. The pyrite concentrate contains 88.7 percent pyrite and 1.39 percent cobalt and represents a recovery of 64.7 percent of the cobalt in the ore. It is shipped to the Davidson Chemical Co. at Baltimore, where it is roasted and the SO_2 used to make sulphuric acid. The calcine is shipped to the Pyrites Co. at Wilmington, Del., where it is treated chemically to recover the cobalt, and the residue smelted for iron. Recovery of cobalt by chemical treatment is 80 percent, and the over-all recovery from the ore is 48 percent. In addition to magnetic reject currently produced, the Bethlehem company has approximately 7,000,000 tons in dumps. This dump material is estimated to contain 0.086 percent cobalt; based on 50 percent recovery, it would yield over 5,750,000 pounds.

Ferro Enamel Supply Co., backed by Defense Plant Corp., erected a plant at Cleveland, Ohio, to treat 2,500 tons of cobalt-nickel speiss, imported from the Bawdwin mine, in Burma, before the Japanese invasion of that country. This speiss contains about 7 percent cobalt, 30 percent nickel, and 40 percent arsenic; it is treated chemically at the rate of 7 tons per day, and the nickel and cobalt are recovered as oxides. When the supply of speiss is exhausted the plant will treat cobalt-nickel matte from ore mined at Fredericktown, Mo., where Defense Plant Corp. has built a 650-ton mill to be operated by the St. Louis Smelting & Refining Co. The cobalt and nickel in the Fredericktown ore are present largely as siegenite, a cobalt sulphide with isomorphous nickel; but the ore is complex, and the concentrate also will contain much lead, copper, zinc, and iron. The concentrate will be separated by a selective flotation flowsheet developed by the Bureau of Mines during the year. The concentrate containing the cobalt and nickel will be roasted and converted into matte, which will be shipped to the Ferro Enamel Supply Co. for treatment.

Other domestic sources of cobalt ore were developed by the Howe Sound Co. and the Bureau of Mines in the Blackbird district, Lemhi County, Idaho. The ores, which originally were mined for gold, contain arsenopyrite, chalcopyrite, and cobaltite. In the ore so far developed the cobalt content is 1.0 to 1.5 percent.

Manganese

During the past year the Electro Manganese Corporation of Knoxville, Tenn., increased its daily production capacity for electrolytic manganese to 4 tons. Recent improvements by the Bureau of Mines in cell design, cathode frame, and anode material and research into the effects of



IN THE ELECTROLYTIC CELL ROOM of the Electro Manganese Corporation, Knoxville, Tenn. Daily capacity was increased during the year to 4 tons of metal. Application is widening in the field of alloys

impurities in the electrolyte and its purification indicate that if produced in sufficient quantities, electrolytic manganese will compete with low-carbon ferromanganese. Electrolytic manganese was used by the Rustless Iron & Steel Corp., of Baltimore, in more than 100 commercial heats of stainless steels of wide variety, with marked advantages over 80 percent ferromanganese. The results were satisfactory regardless of whether the manganese was added to the ladle or in the furnace. Electrolytic manganese is unquestionably the most desirable form of the metal that can be added to stainless steel.

Some electrolytic manganese alloys have unusually high thermal expansion. A manganese-copper-nickel alloy is now used as the high-expansion member of bimetal strip in thermal control instruments and produces nearly twice as much deflection as any alloy heretofore used. A copper-manganese-nickel alloy with greater hardening range and fatigue resistance than beryllium-copper alloys is being commercialized. It is hoped that this new alloy will release for other uses much of the beryllium now employed in copper alloys. Electrolytic manganese is also being used in alloys with magnesium and aluminum bases.

Beneficiation of domestic low-grade manganese ores received much attention in 1943. The new 400-ton concentrator at Butte, Mont., built by Defense Plant Corp. for treating custom carbonate ores, was nearly ready for production in December under the management of the Domestic Manganese & Development Co., which worked out the flowsheet. After flotation to remove sulphides, the rhodochrosite is floated and calcined to remove CO_2 and nodulize the fine concentrate. The product contains over 60 percent manganese. Essentially the same process is used by Anaconda Copper Mining Co. in treating rhodochrosite ore.

A 1,000-ton leaching plant was constructed by Defense Plant Corp. to be operated by M. A. Hanna Co. in treating ore averaging about 24 percent Mn from the Three Kids property, near Las Vegas, Nev. It was proposed to grind the ore to about 40 mesh, then pulp and tower-leach it with SO_2. The resulting sludge is to be separated from the sulphate solution in a settling and washing system. The solution is to be neutralized and evaporated, and the manganese sulphate as recovered by filters, roasted to oxide, and nodulized, and the SO_2 re-used. Capacity operation has not been achieved as yet.

A pilot plant using the Bureau of Mines dithionate modification of SO_2 leaching of manganese ore was operated by the Bureau at the smelter of American Smelting & Refining Co. at Garfield, Utah. Slaked lime is added to the manganese dithionate solution to precipitate manganese hydrate, which is calcined to the oxide. Waste gases from the smelter supply SO_2.

Two-stage matte smelting of low-grade manganese ores from Chamberlain, S. D., and Artillery Peak, Ariz., was done in electric furnaces at Boulder City, Nev., by the Bureau of Mines. The first operation yields manganese-iron matte and a waste slag; and the second yields metallic iron containing all the phosphorus in the ore, manganese sulphide, and a little slag. The manganese sulphide is roasted to an oxide of premium grade, the SO_2 driven off being available for making sulphuric acid.

Manganese up to 5 percent replaced nickel in many stainless steels without adversely affecting mechanical properties.

Molybdenum

Notable improvements in roasting molybdenite concentrates, in making ferromolybdenum and molybdenum silicide, and in briquetting molybdic oxide were made by the Climax Molybdenum Co. at Langeloth, Pa. Standard Nichols-Herreshoff roasters were altered so that individual hearth temperatures could be controlled closely and kept below the fritting and subliming points of the product. Each hearth, except the lower two of the furnace, was provided with individual gas outlets so that cold air could be

drawn across the hearths to absorb excess heat. Thus, caking on the hearths has been eliminated, rabble-tooth wear is reduced, and furnace operation may now continue for years without interruption. The roasting capacity has been increased to more than 15 lb. of molybdenum per square foot of hearth area per 24 hours. The roasted product—technical molybdic oxide—contains 56 to 62 percent Mo and 0.05 to 0.25 percent S. In 1943 over 10,000,000 lb. of technical molybdic oxide went to the metallurgical industry as briquets. Air-floated pitch is added to these in order to produce a self-reducing mixture. Each briquet is a 4-in. cylinder ranging from 4 to 4⅛ in. in length and contains exactly 2½ lb. of molybdenum. Four are made at a time in an electrohydraulic press under a pressure of approximately 10,000 lb. per square inch.

Technical molybdenum oxide mixed with pulverized limestone is sold to alloy-steel makers as "calcium molybdate."

Pure molybdic oxide is made by subliming technical molybdic oxide in a globar doughnut-type furnace at a temperature of 1,800 to 1,900 deg. F. The volatilized oxide is condensed as a light, fluffy powder and recovered in a bag filter. The density of the powder (99.975 percent MoO_3) is increased about seven times by pugging it with distilled water.

The process of making ferromolybdenum from technical molybdic oxide by a thermit reaction was greatly improved in 1943. The oxide, mixed with powdered aluminum, ferrosilicon, iron ore, lime, and fluorspar, constitutes the charge in a bottomless, brick-lined steel shell set over a shallow pit in wet sand. The charge is ignited with a fuse of powdered aluminum and sodium peroxide. The ingredients are so proportioned that reduction proceeds quietly with minimum spitting and dusting. A hood conducts fumes and dust to a bag filter. Smelting is complete in 15 to 20 minutes, and slag is tapped by lifting the furnace shell slightly. After 4 to 6 hours the metal in the sand pit solidifies and is removed by crane tongs, the sintered sand is knocked off, and the 1-ton button is quenched in water. Quenching produces fine cracks that facilitate hand-sledging and crushing. The ferromolybdenum contains 58 to 64 percent Mo, 0.10 percent maximum S, and 0.05 percent maximum P.

A plant for recovering the metal from this thermit slag, erected in 1943, will soon start operations. It also will treat accumulated dumps.

Molybdenum silicide ($MoSi_2$) is made at Langeloth by the thermit method from mixtures of technical molybdic oxide, aluminum, ferrosilicon, lime, and fluorspar. The product contains approximately 60 percent Mo, 34 percent Si, 4 percent Fe, 0.04 percent S, 0.42 percent Cu, and 0.37 percent Al and is often beautifully crystallized. It is used for late additions of Mo and Si to cast iron.

Nickel

One of the outstanding developments of the twelve months in the nickel industry was the commencement of operations of the metallurgical plant of the Nicaro Nickel Co. on Levisa Bay, Oriente Province, Cuba, and the preparation of the company's deposits about 10 miles inland for full-scale production. The ore reserves are extensive and are contained in blanket lateritic deposits that are essentially limonite, and grade into decomposed serpentine with depth. Clearing of vegetation and stripping of the overburden have been in progress for nearly a year, and by the end of 1943 more than 1,000,000 tons of ore had been uncovered, and about 60,000 tons had been shipped to the mill stockpile. The plant is designed to treat 3,600 dry short tons of ore daily.

The bulk of the ore is finely divided, but it contains some lump material. After being crushed by rolls, it is delivered by belt conveyors to rotary dryers. Discharge from the dryers passes through the fine grinding section, consisting of hammer mills, ball mills, and air separators. The ore thence travels to mill silos which are used for intermediate storage and mixing. The next step in the process is the reduction of the nickel oxides by producer gas in sixteen-hearth, oil-fired furnaces, and conditions are controlled to keep the reduction of iron at a minimum. After reduction, the ore passes by conveyors to coolers and is then quenched at a temperature of from 150 to 250 deg. in a solution of nickel ammonium carbonate. The pulp is then fed to Turbo aërators and passes to the countercurrent leaching system and thence to the countercurrent washing system. The product liquor passes to the stripping towers, where ammonia and nickel carbonate are recovered. Tailings from the last washers are treated in a preheater and stripping column to recover ammonia.

The nickel carbonate, after thickening, filtering and washing, passes to an oil-fired rotary kiln for calcining, and the resulting nickel oxide is cooled and packed for shipment to Wilmington, Delaware. The nickel oxide, after briquetting, will be reduced to metal in a 12-ton electric furnace.

Vanadium

As the technology of vanadium and methods of recovering it from its variety of ores (patronite, vanadinite, carnotite, roscoelite, descloizite, and vanadiferous iron ores, phosphates, and asphaltites) were described by George O. Argall, Jr., in the October issue of the *Colorado School of Mines Quarterly*, these methods are not reviewed here. Metals Reserve Co., through its agent, the Sublette Division of the Wyodak Coal & Manufacturing Co., opened new potential sources of vanadium near Sublette, Lincoln County, Wyo., and particularly, Paris and Bloomington, Lake County, Idaho, where the vanadium occurs in highly tilted beds of carbonaceous siltstones of marine origin that contain 0.75 to 1.25 percent V_2O_5. These beds, part of the Phosphoria formation, are 3 to 12 ft. in thickness and extend for many miles. The public lands in which they occur were withdrawn from entry by the Secretary of the Interior, and the deposits were placed under the control of Metals Reserve Co. The Bureau of Mines did considerable work on the recovery of vanadium from these ores. A method involving roasting with salt and pyrite followed by leaching, first with water and then with H_2SO_4 solution, was investigated; and other lixiviants, such as nitric acid and sodium carbonate solutions, were tried.

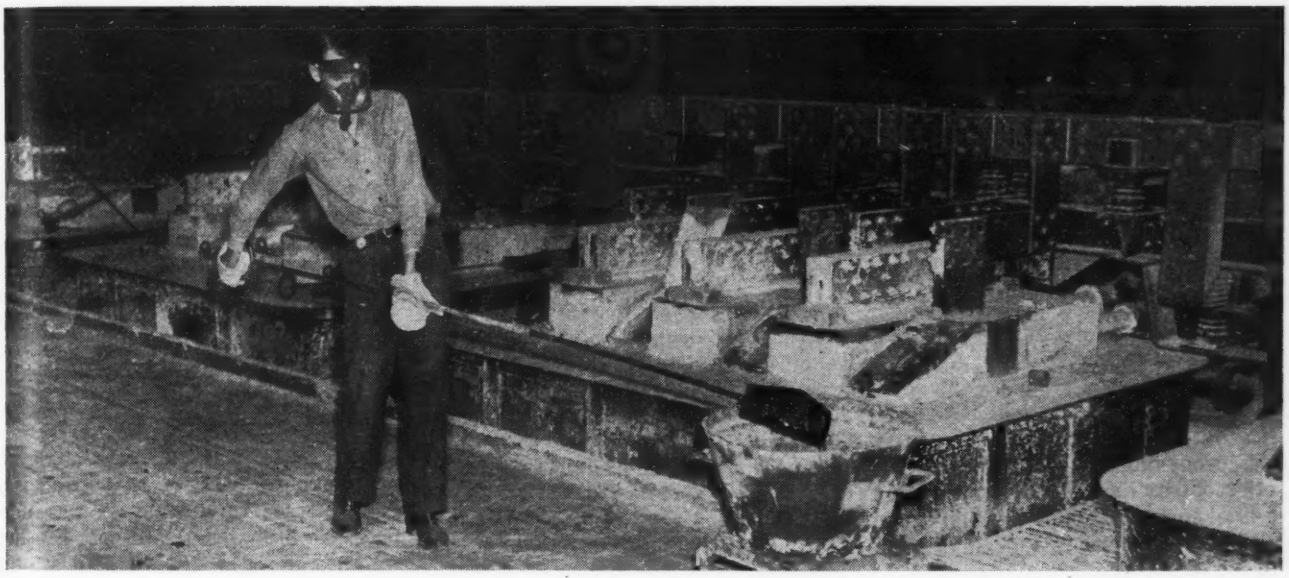
Anaconda Copper Co. continued to recover vanadium from phosphate rock mined near Conda, Idaho. The ore, averaging about 0.2 percent V_2O_5 and 32 percent P_2O_5, is shipped to Anaconda and roasted at 915 deg. C. The calcine is ground in ball mills (65 percent minus 100 mesh) and agitated with sulphuric acid in Pachuca-type tanks. The filtrate containing the vanadium is evaporated to 53 deg. Bé. The vanadium is oxidized by the addition of sodium chlorate to form an insoluble compound with the phosphoric acid. To this precipitate, which contains approximately 45 percent V_2O_5 and 40 percent P_2O_5, sodium carbonate and calcium carbonate are added to form soluble sodium vanadate and insoluble calcium phosphate. Milk of lime is added to the sodium vanadate liquor to purify it, and the vanadate is precipitated and filtered as red cake and fused according to the usual procedure.

Other Metals

No innovations in the technology of columbium, silicon, titanium, tungsten, and zirconium were made public during 1943.

9 Light-Metal Plants Lead Rise of Electrometallurgy

ARTHUR A. CENTER, *Consulting Engineer, 25 Broadway, New York, N. Y.*



BASIC MAGNESIUM, INC., has 880 of these electrolytic cells producing 150 tons of magnesium daily

AT THE BEGINNING OF 1943 the supply of metals produced by electrometallurgy in the United States was insufficient to meet demands. By the fourth quarter production had caught up with nearly all requirements. This was due in part to a greatly improved war situation. The supply of hydroelectric power increased markedly during the year, but the manpower situation did not keep step.

The part played by the government through the Reconstruction Finance Corp. and the Defense Plant Corp. in the metal economy of wartime was summed up by Jesse Jones in July. In the past three years about 25 billion dollars has been spent on government-owned production plants and manufacturing facilities. Much of it was spent for purely military construction of only slight use after the war, but a great deal went into plants which will have postwar uses. Defense Plant Corp. was credited with spending about one billion dollars in expanding steel production and manufacturing plants. The government will own about 10 percent of the total United States steel capacity, which is a little less than 20 percent of average production figures. The total invested in government-owned aluminum production and manufacturing facilities was given as $760,000,000 in 9 production plants and 45 fabricating plants. Their capacity was estimated as about 55 percent of the total (1,000,000 tons plus) for the country. For magnesium plants the figures were given as $430,000,000 invested in plants which can produce over 90 percent of the national output, which at present is 300,000 tons annually.

Aluminum

Exploratory work by geologists for both high-grade and low-grade bauxite deposits in the United States was stressed during the year. In March the United States Bureau of Mines announced the domestic reserves were increased by over 6,000,000 tons. A mill of 1,800 tons capacity of concentrate per day (minus 7 percent SiO_2) produced from bauxite (15 to 30 percent SiO_2) was started. Some of the product was used for abrasives in war plants, and a considerable amount was shipped to Canadian plants. Like programs on smaller scale were carried on to produce alumina from domestic clays and alunite. Seven laboratories and pilot plants were working on alumina production from various raw materials. These plants were located at Rolla, Mo.; Tuscaloosa, Ala.; Salt Lake City, Utah; Boulder City, Nev.; College Park, Md.; Norris, Tenn.; and Seattle, Wash.

Mining of domestic bauxite reached government figures set for supply in some instances—for example, the new alumina plant at Hurricane Creek. It is government owned and operated by the Aluminum Company of America. In August it was announced the WPB ordered a cut of 65 percent in bauxite production for the next eight months. By October the new Alabama deposits were being mined by five private companies, which shipped something over 40,000 tons before the end of the month.

The Long Island aluminum plant started up early in February, 1943, but

its production was sharply curtailed in January, 1944. The government-owned plants increased to nine with a capacity of around 600,000 tons metal per year, compared to the 500,000 tons per year capacity of privately owned plants. Of the latter Alcoa accounts for about 350,000 tons. Some of the 500,000-ton capacity is government-financed. In August the WPB announced that seven new West Coast plants with a total capacity of 125,000 tons were idle since completion because of labor shortage. They are located in labor-short areas. It was further announced that metal stocks were sufficient to make it one of the least critical of the metals placed in that category. Canada delivered about 300,000 tons out of contracts totaling 650,000. Further delivery at the rate of 20,000 tons per month would carry into 1945. Canadian metal (90,000 tons), scheduled to be shipped to the United States in 1944 will be diverted to Great Britain. The U.S.S.R. fourth-quarter allotment of 1943 was moved up to the third quarter with that country accepting one-third of the quota as secondary metal. The WPB Aluminum-Magnesium Division estimated alloy scrap was producing 350,000 tons per year of secondary metal. This would make a total supply of about 1,450,000 tons for the year, against total allotments of 1,278,000 tons.

Jesse Jones late in the year proposed leasing government-owned plants for five years after the war instead of selling in the near future. It was estimated that postwar aluminum requirements would be around 450,000 tons per year. The Army Ordnance Department reported late in the year that there had been a saving of 59,500 tons of aluminum by substituting iron for it in the two-year period 1942–1943.

In December the Bureau of Mines announced that its chemists have succeeded in reducing mineral impurities in three low-ash domestic coals to yield a coke suitable for making electrodes used in the production of aluminum. Calcined petroleum coke has been standard material for this use. Requirements now average about ¾ lb. electrode per pound of metal produced. Mineral impurities were removed by three methods—float-and-sink, acid solution, and cleaning with oil and water. The first reduced the ash content to under 1 percent on five out of seven coals tested. Treatment of the float products with acid solution containing 10 percent hydrochloric acid and 5 percent hydrofluoric acid further reduced the ash content to a minimum of 0.31 percent. The third method did not remove mineral matter as well as the sink-and-float did.

A German theory on the production of aluminum by electrolyzing fused cryolite-alumina mixtures (Chemical Abstracts, 1943, p. 5657) holds that the electrolyzing current is transported almost completely by sodium ions. When the power fails the current is reversed by aluminum redissolving at the cathode and sodium depositing at the anode. With normal current density it is stated there is practically no cathodic deposition of sodium, although it is more noble than aluminum, because sodium has a high overvoltage on aluminum. In this respect it parallels the electrolytic deposition of zinc on aluminum cathodes. Any sodium deposition at the cathode is vaporized at cell temperature (950 deg. C.), and is oxidized at the anode which is near by. At higher temperatures the overvoltage of sodium decreases, more sodium is electrolyzed and oxidized, and the current efficiency drops. Oxygen-containing anions, and not fluorine ions, are discharged, liberating oxygen, which oxidizes the anode carbon to form carbon dioxide or carbon monoxide.

Statements in a Russian paper on the effect of temperatures in electrolyzing alumina are pretty well in line with the foregoing. Efforts to increase production at times of high water, and consequent increased power, by increasing the current density without loss of current efficiency, were not very successful. The conditions for best work were given as constant temperature and a current density of about 0.60 amp. per square centimeter.

Copper

Of important interest is a mid-year estimate from London of postwar production if the war ends in the reasonably near future. The United States figure was set at 1,250,000 tons per year, Canada 350,000, Chile 500,000, Rhodesia 250,000, Belgian Congo, 175,000, and U.S.S.R. 150,000.

Magnesium

In the latter part of the year Jesse Jones stated at a Senate hearing that the government owns 90 percent of the magnesium production facilities and that these are being operated by a half dozen companies. Production for the first half year was given as slightly over 100,000 tons. Basic Magnesium, Inc., started its final unit in July. Anhydrous magnesium chloride, not the monohydrate, is desired for the type of cell in this plant. In his address on receiving the Chandler medal at Columbia University, W. H. Dow brought out that boronate, in making magnesium from sea water, could reduce the magnesium yield to practically nil. Some radical changes had to be made to keep boronate below the desired concentration.

Manganese

The several patents granted concerning electrolytic manganese indicate a spread of interest in the subject: S. M. Shelton to Metallic Manganese Co., Ltd., Canadian patent 414,149 on electrodeposition of manganese; R. S. Dean to Chicago Development Co., U.S.P. 2,317,153 on electrolytically depositing manganese as for bright plating; P. M. Ambrose to Chicago Development Co., U.S.P. 2,316,750 on purification of manganese electrolyte solutions. A Japanese article describes electrowinning manganese from low-grade rhodochrosite ores. The process seems to be similar to that of the Bureau of Mines. A paper from India on anodic oxidation of manganese states that superposition of an a.c. current on the d.c. markedly improves the current efficiency. (J. Indian Chem. Soc. 19, 473–480, 1942).

Tin

The extraordinary commercial development of electrolytic tin plating is a feature of the tin industry, as was indicated in last year's review. By the middle of 1943 the United States Steel Corp. was operating 4 of 9 electrolytic plating units, with the other 5 scheduled to come in by October, 2 at Gary, 3 at the Irwin works, 1 at Birmingham, and 3 in Tennessee. The production of electrolytic tin plate in 1942 was 82,000 tons, the estimate for 1943 was 375,000 tons, and the 1944 guess is 1,500,000 tons from 28 units in the country. This tin plate requires about 40 percent as much tin as the hot-dipped plate (0.50 lb. against 1.25 lb.), but at the Electrochemical Society meeting in October, it was stated that if corrosion resistance of electrolytic tin plate was not improved so that enameling, in and out, was not necessary, a return to hot-dip plate after the war was indicated.

Calcium

An interesting article on commercial-scale production of calcium from electrolysis of fused calcium chloride by A. B. Kinzel, of Union Carbide & Carbon Co., may be found in *Metal Treatment* 9, 193–5 (1943).

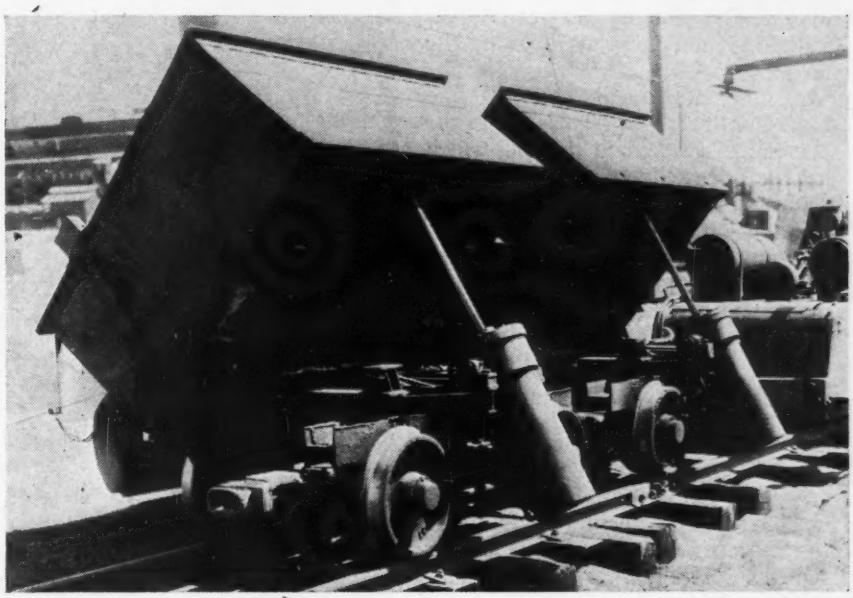
Nickel

The production of refined nickel in the Dominion of Canada was released as 64,500 tons for 1939 and 93,300 tons for 1942.

OPERATING IDEAS

Disposing of Granulated Lead Blast Furnace Slag

WHEN A SLAG-GRANULATING SYSTEM was installed at the Midvale smelter of the United States Smelting, Refining and Mining Company, Midvale, Utah, the cars shown in the accompanying illustration were developed and constructed at the maintenance shops by L. W. Kirk, master mechanic. The body of the car is rectangular in shape, and measures 5 ft. in width, 6 ft. in length, and 2½ ft. in depth. It is mounted on a conventional car chassis, altered to allow for tipping of the body proper, secured by hinges on the dumping side, and by installation of an air cylinder which actuates the dumping motion on the opposite side.



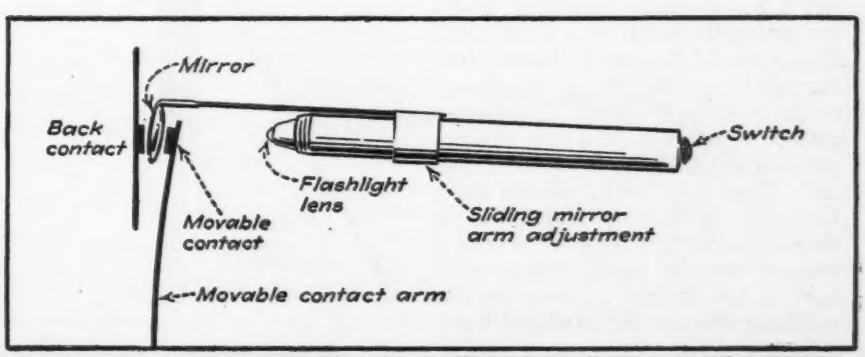
The outstanding feature of the car body is the discharge side. This is a door, hinged at both top and bottom, and divided in the center lengthwise, with the lower half overlapping the upper, thus locking the latter when the car body is in normal or level position. When in dumping position, the lower section of the door forms a chute and permits throwing the material farther away from the track. The lower section of the door is operated by a link and lever attached at both ends of the car and synchronized to the dumping action, causing the lower door to open as the car tips and to close it when the car body returns to level position. The upper door hangs free on its hinges and is thrust open by the weight of the load after the lower door commences to open. The upper door is returned to closed position after the load is dumped by a lightly coiled tension spring at each end of the door. Both springs are attached to the lower part just above the overlap of the lower door.

The dumping cycle is generated by means of an air cylinder mounted vertically on swivel trunnions on the top of the chassis, with the piston-rod end attached to a pin and clevis on the bottom of the car body proper. Air required for the air cylinder is obtained from a Duplex Type D-20 d.c. electric street car brake system compressor salvaged from scrapped street cars. The compressor motor is started and stopped automatically by a pressure switch control operating at 90-lb. and 100-lb. minimum and maximum receiver pressures. Power is taken from the locomotive trolley. Two air receivers, a four-way control valve, and the compressor are mounted on the electric locomotive used to haul the slag cars.

Air is delivered to the car cylinders through a system of pipes and flexible hoses. The control valve is in a position conventent to the operator. A storage tank with a capacity of 300 tons of granulated slag permits an 80 percent slag haulage during the day shift. Each car holds 5 tons of slag, and the operator actuates all controls from the locomotive during a round trip to the slag dump.

Dental Mirror Used to Inspect Relay Contacts

ELECTRICAL EQUIPMENT has numerous relays and magnetic contactors that require routine inspection of their silver contacts. H. G. Pack, of San Mateo, Calif., reports that he has found a dental mirror and flashlight combination, arranged as shown in the sketch, to be most useful in performing this task. The mirror is inserted between the contacts and the light turned on. Thus the invisible surface of the front contact is exposed to examination without removing the contact arm.

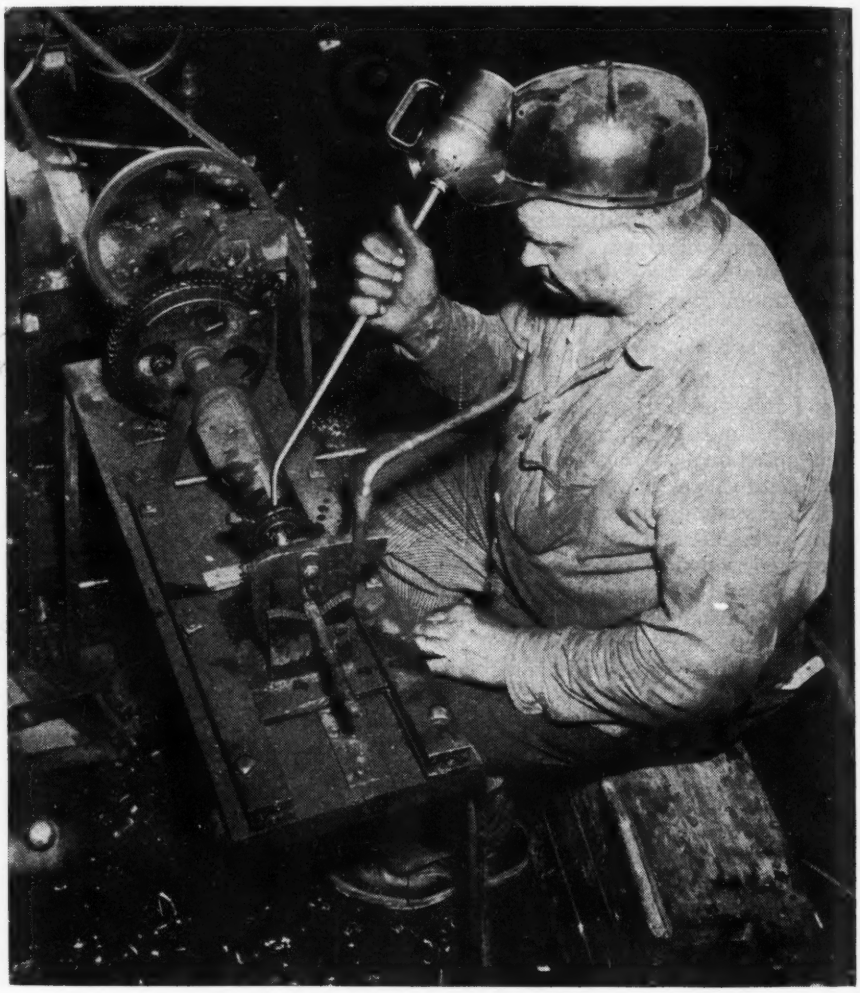


Washing Machine Drive Unit Powers Bolt Threader

TWENTY YEARS AGO mine mechanics drew heavily on Ford Model T parts for building or assembling tools or devices for special jobs, but only recently did there come to light a case of using in a similar manner parts of another milestone in American progress, the washing machine. At the Van, W. Va., mine of Youghiogheny & Ohio Coal Co. there is in regular use in the blacksmith shop a bolt threader which for the drive reduction and head uses a power unit from an old washer.

Though used by N. A. Drow, the Van mine blacksmith, to replenish the stock of extension rods for trolley wire hangers in the mine, the same idea is applicable to bolt threading in metal mine machine and blacksmith shops. Anyone who has a great many bolts to thread in the course of his daily work should welcome, as did Mr. Drow, the possibility of eliminating the seemingly endless job of doing it by hand. The machine which he is shown running in the accompanying illustration was designed specifically to thread bolts ranging from 10 to 18 in. in length, and it can be used for rods or bolts ¾ in. in diameter or smaller.

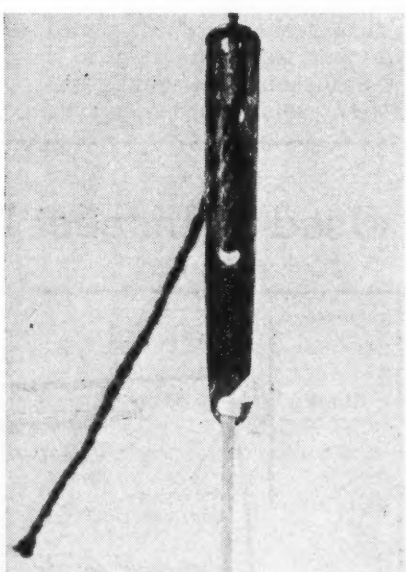
The die holder consists of a section of pipe or tubing welded to the shaft of the gear of the Maytag unit. This gear wheel carried the crank pin for the washer connecting rod. The vise holding the bolts consists of three jaws of a pipe vise. The upper jaw is held down by a crank screw operating in one end of the body of a turnbuckle.



N. A. Drow threading bolts with the machine he made in his shop

Plumb Bob Height Easily Adjusted

AMONG THE operating suggestions which recently won prizes from the WPB was an easily adjustable means for varying the height of a plumb bob, the idea of Melbourne P. Tucker, Bell Aircraft Corp., Buffalo, N. Y. Shown in the accompanying photograph, the device consists of a small strip of sheet metal in which a hook is formed at one end. Three holes are distributed along the length of the strip, and fishline is then threaded through them in such a manner that the plumb bob may be held at any desired position by the snubbing effect of the interlaced line.



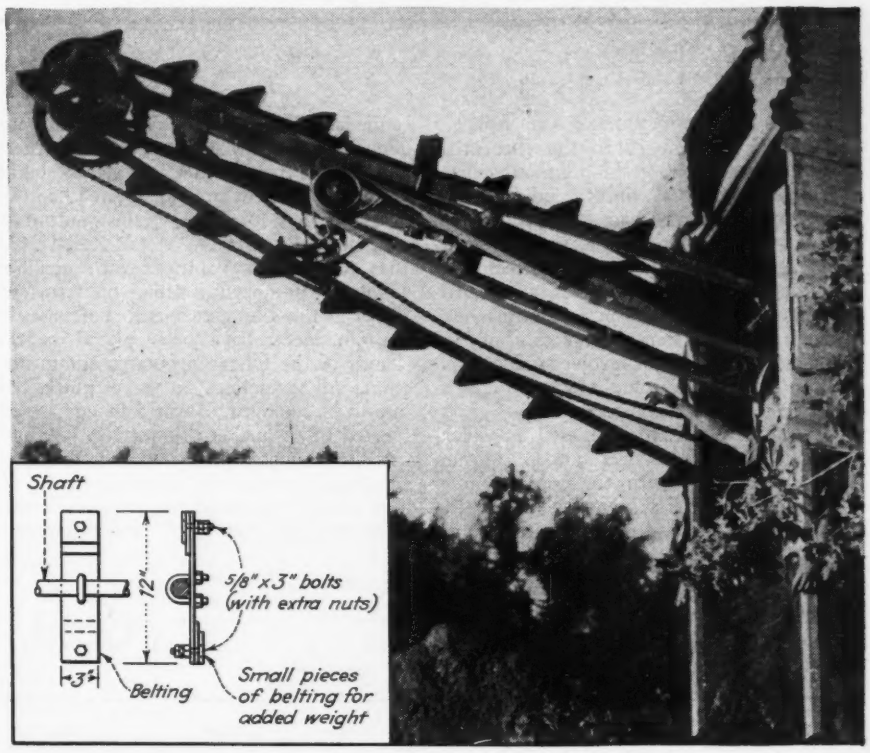
A Penny for Your Thoughts

When you read these Operating Idea pages, do you ever think of something you did or some gadget you made that was a whole lot more ingenious than some of the ideas you've seen described here? If you have, why not write to us about it? It would take you about 20 minutes to jot down a short description and a rough sketch of what you did. You send us the idea. If it's good, we send you $5. That's $5 for 20 minutes' work, $15 an hour, or $720 for a 48-hour week; not bad for extra income. Seriously, though, your "Ideas" on maintenance, supervision and solution of operating problems make up one of the most widely read and generally interesting sections of this magazine. Won't you help make it even more worth while?

Knocker Aids in Emptying Conveyor Buckets

AT A SMALL TUNGSTEN MILL in California, fine tailings are disposed of by a short stacker consisting of a bucket conveyor arranged as shown in the accompanying photograph. Trouble was experienced for some time, however, in that about one-third of the wet, fine material would stick in the buckets and be carried back down to the tank from which the fines are scooped. The difficulty was overcome by installing the knocking device shown in the sketch and the photograph.

A 12-in. length of 3-in. belting was bolted to a shaft as shown, and several square pieces of belting were attached to the ends of the 12-in. piece with ⅝x3-in. bolts. The shaft was mounted as shown near the end of the stacker and the device was rotated by belt drive from a small variable-speed motor. As the weighted ends of the knocker revolve, they strike against the under side of the belt approximately over each bucket on the other side. The impact effectively loosens the residual material in the bucket, and each bucket now returns empty.



Simple Belt Conveyor Tonnage Estimator

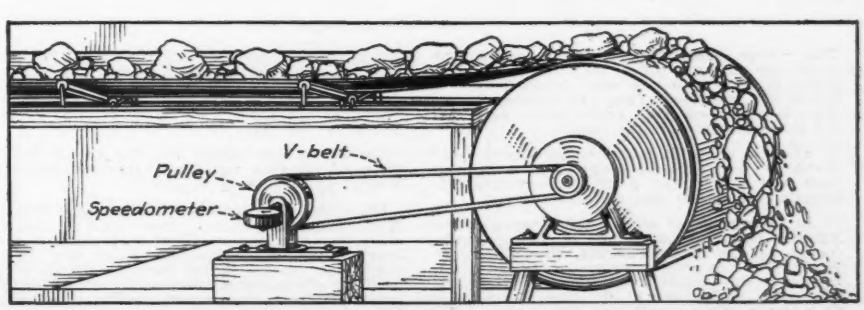
OBTAINING AN ESTIMATE of the tonnage of ore handled is a necessary part of all milling operations, but few small-mine operators can afford to install the continuous weighing and recording devices which are the only accurate means of measuring tonnage. A. M. Derr, mill foreman and assayer of the Hope Silver mine, at Clarks Fork, Idaho, has worked out an arrangement which he says has been found satisfactory for estimating the tonnage of ore handled over a conveyor belt. The Hope Silver mill treats about 50 tons per shift.

An automobile speedometer is fitted with a small V-belt pulley attached to the drive shaft in place of the original cable. The speedometer is then clamped to the belt conveyor frame in such a way that the drive shaft pulley can be belt-connected to the shaft at either end of the conveyor belt. By determining the distance a point on the belt travels in order to record 0.1 miles on the speedometer, the factor is established for calculating the distance traveled by the belt per shift, assuming V-belt driving the speedometer is maintained at a constant and proper tension.

Mr. Derr reports that the practice at the Hope mine is to determine the weight of ore carried per foot of belt by taking hourly samples and weighing them. These samples are taken by means of a rake or scoop which is designed to collect ore from exactly one foot of belt surface, but this method seems open to some question with regard to its accuracy, inasmuch as a small error in collecting the sample may make quite a large error in the final tonnage estimate.

For this reason, it would seem preferable to take the tonnage samples by some more accurate method, such as diverting the entire stream of ore as it falls from the end of the belt for a definite time interval. This interval might be the time required for a convenient length of belt to pass a given point. By convenient is meant the greatest length of belt that can be taken before the resultant sample becomes unwieldy. Thus, a sample taken carefully from five feet of belt approaches accuracy, but a sample taken hastily from one foot of belt does not and can not be expected to.

In any case, when the figure for average weight of ore carried per foot of belt per shift is determined, it is multiplied by the distance traveled by the belt per shift as recorded by the speedometer, and the result divided by 2,000. Tonnage estimates obtained in this way must be used cautiously and with recognition of the true meaning of the word "estimate," which Webster says means "to fix the worth, value, size, or extent of . . . roughly or in a general way."



MARKET SUMMARY

THE WAR PRODUCTION BOARD issued a statement on Jan. 17 to the effect that there could be no resumption of general civilian production until pending major military operations had been concluded. This announcement put to rest the growing agitation for increased allotments of non-ferrous metals for civilian goods, particularly copper and zinc. Controls have been eased in some instances, but the changes made did not involve sizable quantities. In the meantime, stockpiles are expected to increase appreciably.

Price developments centered in quicksilver. The metal was under pressure throughout the month, the price dropping from $180 per flask, New York, at the beginning of January, to $130 as the month ended. The sharp decline forced many producers to curtail operations, and authorities believe that the lower price level should bring about a cut in production to 35,000 flasks or less for 1944, against output of 53,500 flasks in 1943. Metals Reserve Co. has canceled its contracts with qualified domestic producers, settling on terms set forth in the sales agreement. Purchases of foreign metal have been placed in the hands of the foreign economic administration. All restrictions on use of quicksilver are to be removed, as war demands are expected to be smaller this year. A year ago, WPB estimated that 90,000 flasks of quicksilver would be required for 1943, but a final accounting for the year showed that not more than 53,000 flasks were consumed. Cancellation of large export demand was a factor in upsetting earlier calculations.

Though two large copper producers have returned to the six-day week, production continues at close to the peak rate. Domestic deliveries for January were on a smaller scale, and well below the monthly average of 136,996 tons for 1943. Domestic deliveries include foreign metal allocated by the government. Domestic output of refined copper averaged 100,572 tons monthly during the last year.

Outstanding in developments in copper was a statement from London admitting an improved supply situation for the United Nations, and, because of this condition, it has become necessary to modify

Major Metals

U.S. DAILY AND AVERAGE PRICES

1944 Jan.	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: St. Louis
1			Holiday			
3	11.775	11.700	52.000	6.50	6.35	8.25
4	11.775	11.700	52.000	6.50	6.35	8.25
5	11.775	11.700	52.000	6.50	6.35	8.25
6	11.775	11.700	52.000	6.50	6.35	8.25
7	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
11	11.775	11.700	52.000	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
25	11.775	11.700	52.000	6.50	6.35	8.25
26	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
31	11.775	11.700	52.000	6.50	6.35	8.25
			AVERAGES FOR MONTH			
Jan.	11.775	11.700	52.000	6.50	6.35	8.25
Jan.			AVERAGES FOR WEEK			
5	11.775	11.700	52.000	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
26	11.775	11.700	52.000	6.50	6.35	8.25
Jan.			CALENDAR WEEK AVERAGES			
1	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25

Gold, Silver, Sterling

DAILY AND AVERAGE PRICES

1944 Jan.	Sterling Exchange: "Checks" (Nominal)	Sterling Exchange: "90-day demand"	Silver: (c) New York	Silver: London	Gold: London	Gold: (d) United States
1			Holiday			
3	401.000	(f)	44.750	23.500	168s	$35.00
4	401.000	(f)	44.750	23.500	168s	35.00
5	401.000	(f)	44.750	23.500	168s	35.00
6	401.000	(f)	44.750	23.500	168s	35.00
7	401.000	(f)	44.750	23.500	168s	35.00
8	401.000	(f)	(e)	(e)	(e)	35.00
10	401.000	(f)	44.750	23.500	168s	35.00
11	401.000	(f)	44.750	23.500	168s	35.00
12	401.000	(f)	44.750	23.500	168s	35.00
13	401.000	(f)	44.750	23.500	168s	35.00
14	401.000	(f)	44.750	23.500	168s	35.00
15	401.000	(f)	(e)	(e)	(e)	35.00
17	401.000	(f)	44.750	23.500	168s	35.00
18	401.000	(f)	44.750	23.500	168s	35.00
19	401.000	(f)	44.750	23.500	168s	35.00
20	401.000	(f)	44.750	23.500	168s	35.00
21	401.000	(f)	44.750	23.500	168s	35.00
22	401.000	(f)	(e)	(e)	(e)	35.00
24	401.000	(f)	44.750	23.500	168s	35.00
25	401.000	(f)	44.750	23.500	168s	35.00
26	401.000	(f)	44.750	23.500	168s	35.00
27	401.000	(f)	44.750	23.500	168s	35.00
28	401.000	(f)	44.750	23.500	168s	35.00
29	401.000	(f)	(e)	(e)	(e)	35.00
31	401.000	(f)	44.750	23.500	168s	35.00
			AVERAGES FOR MONTH			
Jan.	401.000	.....	44.750	23.500	....	35.00
Jan.			AVERAGES FOR WEEK			
5	401.000	.....	44.750	.....	....	.....
12	401.000	.....	44.750	.....	....	.....
19	401.000	.....	44.750	.....	....	.....
26	401.000	.....	44.750	.....	....	.....

Calendar week averages, New York Silver: Jan. 1st, 44.750; 8th, 44.750; 15th, 44.750; 22nd, 44.750; 29th, 44.750.
(e) Not quoted (Saturday). (f) No quotation.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal*'s average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c. per troy ounce. Handy & Harman's quotations on newly-mined domestic silver, 999 fine was 70⅝c. throughout January.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

production policy. The British Government, the statement adds, is obliged to reduce purchases from Northern Rhodesia by 20 to 25 percent of the aggregate actual rate of production achieved in 1943. Schedules will be cut back beginning April.

Tension over the Bolivian political situation increased, but up to the end of January production and exports of tin concentrates from that country continued without interruption. The State Department announced that it has refused to recognize the revolutionary government, and similar action was taken by the British authorities. The Belgian Congo has been exporting tin to the United States at the rate of about 1,800 tons a month, a welcome contribution under prevailing conditions.

Deliveries of both lead and zinc declined during January, owing to the growing desire of consumers to reduced inventories.

The January statistics of the American Zinc Institute showed that stocks at the end of the month totaled 194,311 tons, against 173,666 tons (revised) at the end of December.

Miscellaneous Metals Monthly Averages

Average prices of miscellaneous metals for December and January.

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

	Dec.	Jan.
Quicksilver, N. Y. flask.	190.077	151.600
Antimony (a)	15.839	15.839
Antimony, bulk, Laredo.	14.500	14.500
Antimony, bulk, N. Y...	15.265	15.265
Antimony, Chinese (b).	16.500	16.500
Platinum, oz. troy	35.000	35.000
Cadmium (c)	90.000	90.000
Cadmium (d)	92.500	92.500
Cadmium (e)	95.000	95.000
Aluminum, ingot	15.000	15.000

E & M J Price Index

Weighted index of non-ferrous metal prices (copper, lead, zinc, tin, silver, nickel, and aluminum). The average for the years 1922-1923-1924 equals 100.

1929	110.33	1936	73.45
1930	82.87	1937	90.86
1931	60.20	1938	73.67
1932	48.26	1939	77.71
1933	59.79	1940	79.22
1934	69.59	1941	83.49
1935	74.66	1942	86.80
		1943	88.74

	1942	1943	1944
January	85.39	88.74	88.74
February	85.90	88.74	....
March	85.90	88.74	....
April	85.90	88.74	....
May	85.90	88.74	....
June	85.90	88.74	....
July	85.90	88.74	....
August	85.90	88.74	....
September	88.74	88.74	....
October	88.74	88.74	....
November	88.74	88.74	....
December	88.74	88.74	....

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(Feb. 1, 1944)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	15c.
Antimony, domestic, spot, lb. 5 tons or more	15.839c.
Bismuth, ton lots, lb	$1.25
Cadmium commercial sticks, lb	90c.
Calcium, lb., ton lots 97 @ 98 per cent	$1.25
Chromium, 97 per cent grade, lb	89c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	20½c.
Palladium, troy oz	$24.00
Platinum, (Official quotation) troy oz	$35.00
Quicksilver, flask of 76 lb., 100 flasks or more	$130.00@$135.00
Radium, mg. radium conten	$25.00@$30.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, carloads, lb	14.75c.
Tellurium lb	$1.75
Thallium, 100 lb. or more, lb	$10.00
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, 10 to 12% BeO, f.o.b. mines, ton	(b)$190.00@$193.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry, 48% Cr_2O_3, 2.8 to 1 ratio	$41.00
48% Cr_2O_3, 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$76.54
Manganese (dutiable) f.o.b cars Atl. ports long ton unit Mn:	
50 per cent	79.8c.
48 per cent	78.8c.
46 per cent	76.8c.
Manganese Ore, domestic, 48%, f.o.b. MRC depot, l.t. unit	$1.00
Molybdenum Ore, 90%, per lb. of MoS_2, f.o b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 65 per cent, duty paid	(b) $24.00
Domestic, 65 per cent and upward	(a) $26.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27.50c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.; per ton	$55.28

(a) Prices at mines, small lots, usually several dollars less. (b) Nominal

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	4c.
Cobalt Oxide, 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$5.00

ALLOYS

Beryllium Copper, 2.5 to 3 per cent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent per pound of Cr contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$135.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 per cent, per lb. of contained Si	6.65@8.10
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90
Silicomanganese, 1 per cent C, gross ton	$133.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$650@$750
Crude No 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, long ton:	
Georgia, crude	$8.50@9.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.75@$7.25
Bauxite, long ton:	
Domestic, crude, 50 @ 52 per cent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 85-5 per cent, all rail movement, ton	$33.00
Acid 98 and 1 per cent, bulk, ton	$37.00
Fuller's earth, f o b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00

Mica—Base prices on sheet, North Carolina one-half trim, as posted by the Colonial Mica Corp., the Government's buying agency for obtaining strategic mica, per pound, follow: Sheet to cut minimum of 1½ × 2 in. $2.40; 2 × 2 in. $3.52; 2 × 3 in. $4.64; 3 × 3 in. $5.12; 3 × 4 in. $6.08; 3 × 5 in. $7.04; 4 × 6 in. $8.00; 6 × 8 in. $9.12; punch, 30c. Premium and discounts up to 40 per cent, depending on quality and trim. Scale does not apply to non-strategic mica.

Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	12c., nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$23.50
Steel, base prices, Pittsburgh Billets, gross ton	$34.00
Structural shapes, 100 lb	$2.10

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

Stockpile Question Approaches a Crisis

The three blind men who submitted widely divergent reports on the structure of an elephant came nearer agreement than do the many individuals and agencies now attacking different phases of the question of stockpiling minerals and metals. The Western mining man (See p. 118) wants stockpiles built of domestic metal drawn largely from otherwise uneconomic sources; the State Department wants stockpiling managed in a way that will reinforce the Good Neighbor policy; W. L. Batt, WPB vice chairman and U. S. member of the Combined Raw Materials Board, wants stockpiles built of foreign metals acquired under reverse Lend-Lease; Senator Scrugham has prepared a stockpile bill that is tailored to fit everybody and seems destined to satisfy nobody. Anyone, in fact, who is connected in any way with the mineral industries is likely to have a stockpile plan up his sleeve, and the nearer the day approaches when some plan must, if ever, be put into effect, the more urgent becomes the clamor for each one of these plans.

Nervousness of the men actually doing the mining boiled over at the Denver meeting of the American Mining Congress and the Colorado Mining Association, and they demanded in no uncertain terms that a policy be set so that mining men can tell where they stand. Even as they were ending their meeting, however, WPB was reported as setting a course on stockpiling that seemed likely to add to the miners' confusion and irritation.

According to The Associated Press, the WPB has decided to limit the size of stockpiles of certain raw materials, including most metals, to three months' supply "at the full wartime rate of use"; or to one year's supply, less the amount that the North American continent can produce, whichever is the greater. WPB division directors have also been instructed to see that England and our other Allies are notified "at a very early stage" when important changes are planned in U. S. policies regarding importing and stockpiling raw materials that foreign countries have helped to supply. The AP says these actions were not officially announced but were verified by official sources.

Obviously this policy calls for a lot of explanation and "clarifying orders." Take copper, for example. Does "wartime rate of use" mean the peak month? If so, the stockpile would be three times 150,451 tons, or 451,353 tons. But total 1943 deliveries were 1,643,955 tons, and if we subtract "what the North American continent can produce" (about 1,530,000 tons) we get a stockpile of only about 100,000 tons. We now have a copper stockpile of about 300,000 tons. Where do we go from here? What about scrap copper? The industry may expect this WPB action on these important matters to get a powerful going-over before it is announced officially.

Industry Committees To Aid Reconversion

Countering WPB's apparent lack of comprehension of the mining industry's attitude on stockpiling, were certain provisions of a general administrative order of WPB that was made public on Feb. 1. The order was formulated to govern use of the many industry advisory committees set up by WPB.

The new regulations specify that no limitation or conversion order and no amendment to an existing order may be issued without prior consultation with an industry advisory committee if the proposed change will result in a substantial change in the operations of the industry affected. The mining industry is well represented by industry advisory committees made up of some of the most capable and intelligent men in the business, and it can only be hoped that their advice will be heeded, as well as sought, before any fixed course of action is established.

The order does provide that a vice chairman of WPB may waive consultation with an industry committee if the proposed order is of an unusually confidential nature or if extreme speed of issuance is essential, but industry representatives see little likelihood of the necessity of invoking either of these provisions.

In any case, reconversion to any sort of large-scale production of civilian goods is not even a possibility until after Germany is defeated. Some relaxation can be noted in orders governing use of certain metals, copper, aluminum, and steel, for example; but this is being done only where a saving in manpower may result through use of these metals or where the metal can replace wood or other material now in shorter supply.

Tremendous pressure for reconversion is being exerted against top officials of the WPB, but Donald Nelson's answer to it is a repeated, "No." Addressing the conference of mayors in Chicago late in January, Nelson said: "Speaking personally, I would rather be two months late in reconversion than five minutes late in military production. Not that I expect the WPB to be late in reconversion. On the contrary, our plans are being crystallized right now, and we will be ready to act at the moment when the time is ripe for action."

Most Washington observers feel that the ripeness of the time will be judged by the military and not by Donald Nelson, a circumstance which both labor and management executives find annoying if not actually frightening. If WPB policy is directed, as it seems to be, strictly in accordance with the ideas of high Army and Navy officers, appeals of management and labor based on fear of financial loss or unemployment will find little sympathy. The Invasion comes first.

Tin Holds Place on Critical List

Tin remains in short supply. Announcement by the Office of War Information that tin would be among the metals removed from the critical list in 1944 was in error, according to WPB officials. Since that announcement, other branches of industry have assumed that tin was in a much easier position because the amount of tinplate allocated for the 1944 canning season was much greater than in 1943. More food will be packed in metal in the coming season merely because steel is in better supply than paper and glass. All container materials are critically short, especially those that depend upon wood pulp.

The national tin stockpile is going down. There are two great demands that show no signs of growing less in the near future. One is the demand for tinplate by the food processors mentioned above. The other is the tin for use in bronzes that must be used under water.

It is no secret that when the shipbuilding program is cut back, the use of tin for bronze will be reduced correspondingly, but it might also be said that even though there should be a cutback in the shipbuilding program, no easing of the tin conservation order is to be expected.

Military Alone Want National Service Act

The President's plea for a National Service Act was merely a bone tossed to the men in the armed forces, according to experienced political observers in Washington. They point out that the time for such a drastic move has long since past. The White House has always shied away from the move until it became evident that Congress would defeat the measure. This would then give the President the opportunity to tell the men in the service that he had done his best to back them up on the home front but that Congress would not permit him to do so.

From a practical standpoint labor officials point out that the legislation at this time is unsound. The passage of the enabling bills will take some time. After which it will take possibly three months or more to set up the organization to administer the act. However it is set up, there is no chance of establishing an organization that

can function in less than six months more. By that time, sometime in the spring of 1945, there may be no need of National Service. It must be remembered that this idea that a National Service Act will not be needed in 1945 may be very wrong. Some believe that the need will be greater then than at any previous time.

Behind the scenes it is reported that labor has really never considered that the Chief Executive was serious. They have said privately that the move was one of political expediency and that it could not be construed as a White House move away from labor. The CIO has given weight to this idea by endorsing a fourth term.

Army and Navy support of the National Service idea has been strong and to all appearances sincere. This is in line with the traditional thinking of the general staff, unchanged since Pearl Harbor. It is considered unlikely that their ideas will prevail, although anything can happen in wartime Washington.

Magnesium Production Remains Uncut

No cutback has been made in production of magnesium, although there is a possibility of some adjustment by late spring or early summer. The present rate of production of the metal is slightly in excess of consumption, and when the stockpile becomes large enough (how much is enough, and how high is up?), action to curtail production may be expected. Some say the cut-off will come when the stockpile reaches two months' consumption at the current rate, but the latest expression of policy, mentioned in the first item on page 114, suggests a three months' supply.

Aluminum Cutbacks Amount to 14 Percent

Closing of four potlines on Dec. 31, closing of three more on Feb. 1, and the voluntary shutdown of eight small lines by ALCOA, represent a cutback in aluminum production of approximately 330,000,000 lb. annually. This is about 14 percent of total domestic capacity of 2,300,000,000 lb. Canadian capacity is about 1,100,000,000 lb., giving the North American continent a total capacity in round figures of 3,330,000,000 lb. annually.

The present stockpile of pig aluminum being built up by the government is 250,000,000 lb. of primary metal and 75,000,000 lb. of secondary metal. This does not include rough castings and semi-finished parts that are "riding on the line." The visible supply, including all stocks and work in progress, might amount to 750,000,000 lb. Most of this metal would be remelted if plane production were halted for any reason, and must therefore be considered as a part of the backlog of raw material. Total reserves of all kinds are more than a billion pounds.

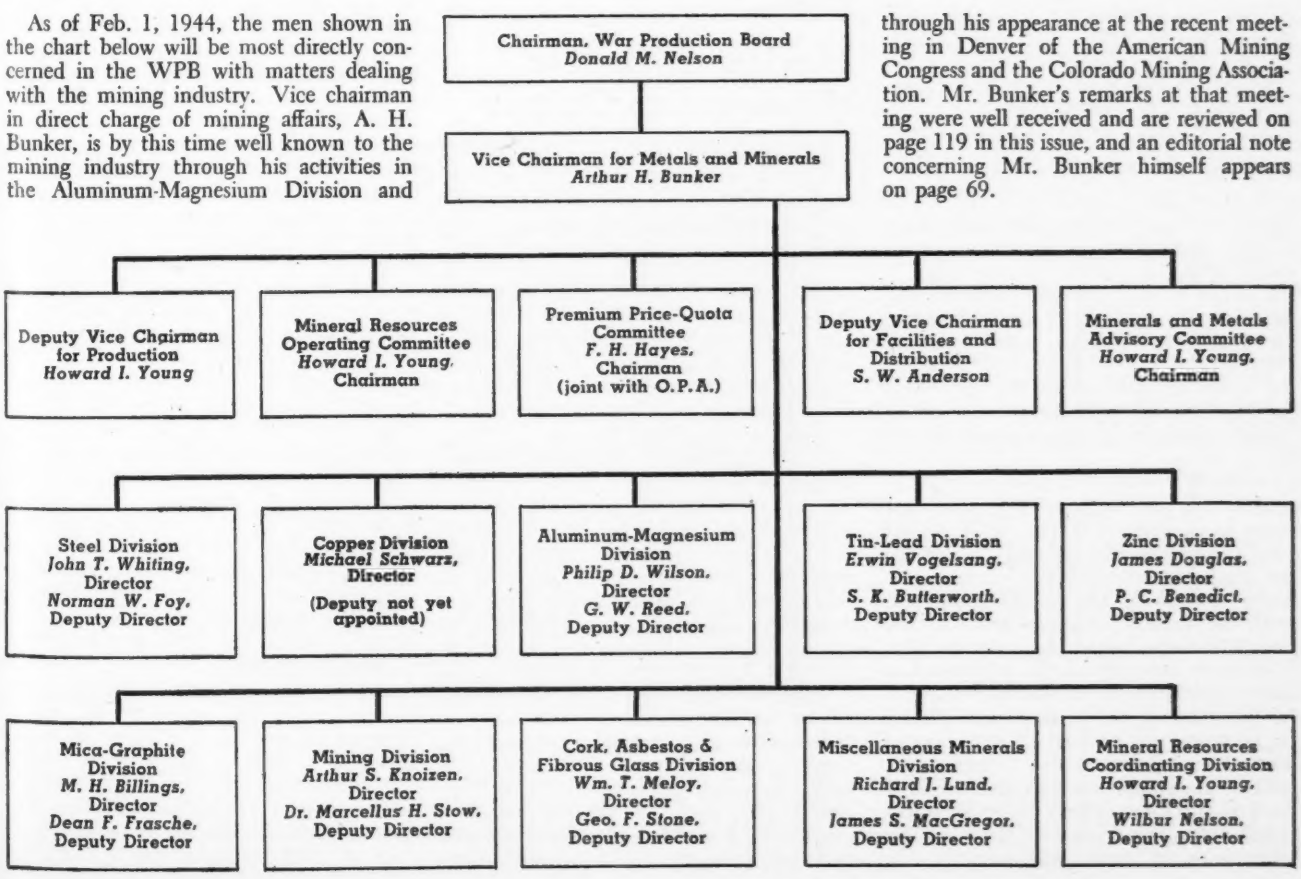
In closing the four potlines on Dec. 31 and the three additional lines a month later, the WPB killed two birds with one stone. In addition to making a desired cut in production of aluminum ingots, 2,225,000 tons of coal will be saved yearly and the fuel shortage in the New York area will be eased by that much; and the load on transportation systems lightened. Alumina for the New York plants is shipped from the Mississippi Valley, and some of this rail haul has been eliminated. The tight fuel situation in the New York area was disclosed when Secretary Ickes, speaking as Solid Fuels Administrator, announced that 35,000 tons of low-volatile bituminous coal was being sent to New York.

Depletion Allowance On Fluorspar Not Lost

Defeat in the Senate of an amendment to the tax bill that would give rock asphalt, fluorspar, and some other minerals permanent depletion allowances similar to those in effect for oil, natural gas, coal, and sulphur is not necessarily final. The amendment, offered by Senator Thomas, of Oklahoma, was defeated in January by a vote of 38 to 34, but it is possible that the provision may be added in conference.

THIS ORGANIZATION IN WPB NOW HANDLES MINING AFFAIRS

As of Feb. 1, 1944, the men shown in the chart below will be most directly concerned in the WPB with matters dealing with the mining industry. Vice chairman in direct charge of mining affairs, A. H. Bunker, is by this time well known to the mining industry through his activities in the Aluminum-Magnesium Division and through his appearance at the recent meeting in Denver of the American Mining Congress and the Colorado Mining Association. Mr. Bunker's remarks at that meeting were well received and are reviewed on page 119 in this issue, and an editorial note concerning Mr. Bunker himself appears on page 69.



NEWS OF THE INDUSTRY

Chile to Auction Gold as Anti-inflation Step

Under terms of an agreement reached recently among the U. S. Treasury Department, the Federal Reserve Bank, and the Banco Central de Chile, the Chilean government will henceforth auction once each week the gold contained in copper and gold ores, concentrates, and bars sent from Chile to the United States. Buyers will pay in Chilean paper currency and will receive monetized gold pieces. The Santiago correspondent of *E.&M.J.* reports that this step was taken as a counter to the rising inflation of Chile's paper currency and to halt an increasing flow of the country's gold to black markets in Argentina and Brazil.

Under the agreement, the gold exported from the country will be returned to Chile in the form of bar gold. This will be delivered to the producers, who will turn it over to the Mint to be assayed. All bar gold produced within the country will go directly to the Mint. Having been weighed and assayed, this accumulation of gold will then be auctioned weekly in the Santiago Stock Exchange. Proceeds, less a government tax, will go to producers; buyers will receive not the bar gold, but monetized gold pieces each containing 18.3 grams of gold.

Until this arrangement was made, gold producers had been at a disadvantage, because the law compelled them to sell their gold to the Mint at a price considerably lower than that obtainable in neighboring countries. As always happens when the official price of a commodity is lower than the public is willing to pay for it, a black market in gold developed. The result has been that ever since 1932, when Chile's currency was considerably debased, much gold has found its way illegally out of the country, although it was needed at home to pay for essential material from abroad. Chilean miners received from the Mint 34.88 pesos ($1.12 U. S.) per gram for gold. Over the mountains in Argentina they could get up to 43 Chilean pesos for it, approximately $43.40 U. S. per oz.

Recently, because of the war, Chile's exports are larger than its imports and there is an excess of dollars in the market that the government has been compelled to buy, by issuing paper currency, in order to provide the mining companies with the necessary Chilean pesos to pay for labor, taxes, freight, and import duties. The result has been a glut of paper currency far in excess of the normal needs of the country, and a dangerous inflation is in progress. Through the auction of the gold, some of the excess paper currency will be exchanged for gold and will flow back to the Central Bank to be destroyed. In this way the miners will now get the true price of their gold—that is, the amount the public is willing to pay for it—and some kind of a brake will be placed on inflation.

The dollars obtained by the government in exchange for issuing the paper currency have been converted into gold and deposited in New York as a reserve with which eventually to buy machinery and the other essential commodities that Chile has been unable to obtain from the United States because of the war.

It is hoped that the auction price of the gold will reach at least 45 pesos per gram ($45.00 per ounce). The government will take 30 percent of any excess in price above 45 pesos, but if the price goes above 60 pesos, the government will take 50 percent of the excess above 60. This agreement, which has taken the National Mining Society a whole year's hard work to bring about, is looked upon by the gold miners of Chile as a satisfactory and just arrangement.

The terms of the agreement also allow Chile to re-import all the gold exported to the U. S. since April 1, 1943. About $3,500,000 will be required for this purpose, and the Caja de Credito Minero in Chile is arranging with the National City Bank of New York to acquire the necessary funds. It has been estimated that the cost of freight and insurance to return gold to Chile will be about 6 percent of its value.

Rhodesian Copper Mines to Cut Output

Because British government purchases of Rhodesian copper will be cut 20 to 25 percent in 1944, production of the metal in that country will be curtailed a like amount in three stages, beginning on April 1, according to a recent Colonial Office announcement. This agency says the action was taken because of the improved United Nations' copper supply situation that has made necessary a revision of original emergency production policies. The new production base will be reached by July 1.

The cut-back will be distributed pro-rata among Roan Antelope, N'Kana, and Mufulira. A fourth company, N'Changa, will continue at is present rate, but plans for a £1,500,000 plant expansion there have been abandoned. No recent production figures have been released for these mines, but their output has certainly been increased since 1939, when the colony produced 238,100 tons of copper.

This, the first real cut-back in copper among the United Nations, was reported to have taken some American producers by surprise. As far as can be learned, no similar cuts have been permitted for this country, but there is evidence that production in a number of mines is being curtailed somewhat. This country's copper stockpile is now more than 300,000 tons and is still growing.

American Metal Co., Ltd., owns about 32 percent of Roan Antelope's stock and over 50 percent of Rhodesian Selection Trust, Ltd., a company holding a 64 percent interest in Mufulira. Another American company, Newmont Mining Co., is interested in the Rhodesian coppers through its holdings in Rhodesian Anglo-American Ltd., the largest stockholder in Rhokana Corp. Rhokana owns the N'kana property, has a 32 percent interest in Mufulira, and owns 47 percent of N'Changa.

Anaconda Executive Offers Stockpile Plan

The preliminary report of the postwar planning committee of the Commerce and Industry Association of New York, released recently, contains suggestions for raw-materials stockpiling developed by E. O. Sowerwine, assistant to the president of Anaconda Copper Mining Co. Although he discussed both agricultural and forest product aspects of the problem, Mr. Sowerwine dealt largely with the stockpiling of mineral raw materials.

With reference to copper, the plan suggests that the government stockpile all metal in whatever form owned by it or for which it has contracted at the end of the war. All scrap on hand or recovered from battlefields should be processed to refined metal and stockpiled. Furthermore, during a period of postwar adjustment, perhaps from six months to a year, the government should continue to purchase, and stockpile, the metal output of those high-cost projects fostered by the government during the war. To facilitate orderly return to a normal business basis, the larger companies should as rapidly as possible, compatible with maintenance of widespread employment, adjust their production to fit market requirements, and only that portion of their output in excess of such requirements during the adjustment period should be stockpiled.

"On a basis of long-range planning," Mr. Sowerwine says, "and effort to smooth out the peaks of production and the valleys of depression, a plan might be devised which would give the larger mines some normal assumed basis of production for a period (as long as five years) with a provision that excess production could be added to the stockpile at the option of the producers."

One objective of such stockpiling, Mr. Sowerwine believes, would be the establishment of reserves of strategic, also referred to as critical, materials of which this country does not have adequate domestic sources. He points out that the United States is deficient in supplies not only of certain obvious metals, such as

tin, but also of copper, lead, and zinc. A stockpiling plan, he says, would safeguard and prolong the restored period of peace by assuring to this country such a sufficient supply of raw materials that no other country might falsely assume that we could be caught at a disadvantage for lack of them.

In common with practically all informed opinion in this country today, Mr. Sowerwine holds the belief that full employment must be one of the primary objectives of postwar economies throughout the world. Minerals stockpiling in the United States, he feels, can be of great help in accomplishing this condition, for men must work to produce these stockpiles and their work will then be productive rather than economically wasteful, as would be the case in government dole or some form of leaf-raking. "Morale," he adds, "would not be destroyed by doles or charity, but would be restored by work and production."

"Any basis of stockpiling," Mr. Sowerwine says, "should be as a permanent protection and should be under the joint and exclusive control of the Army and the Navy. . . . Every possible safeguard and precaution should be made to insure against the dumping of these supplies on the market by act of Congress or of any future administration."

MMSW Wins Election at International Nickel

Local 598, the largest local in the Mine, Mill and Smelter Workers Union, was established on Dec. 17 as bargaining agent for the employees of the International Nickel Co., Sudbury, Ont., when it won a Labor Court election by a large majority. The vote was 6,913 for the MMSW, 1,187 for an independent local union, 675 for no union. Employees of Falconbridge Mines voted on Dec. 20 to join a unit of Local 598 by a vote of 765 to 161. Reid Robinson, president of the MMSW, hailed the election as a great victory and welcomed the new local "to our great movement of free and independent workers in the metalliferous fields of the Western Hemisphere." The last phrase, apparently, refers to attempts of the MMSW to establish connections with workers' organizations in Mexico and South America as well as in Canada and the United States.

Bureau Releases Part of Minerals Yearbook

Acting under revised security regulations of the Bureau of the Budget, Dr. R. R. Sayers, director of the Bureau of Mines, announced recently that certain hitherto confidential information on production of aluminum, bauxite, copper, lead, zinc, magnesium, and mercury in the United States will be made public through resumption of regular Bureau of Mines reports.

Although the Minerals Yearbook for 1942, like that of 1941, will not be released as an entire volume, because it contains confidential foreign trade data, certain chapters of the yearbook describing gold, silver, copper, lead, and zinc production of individual states or groups of states will be made available for purchase from the Superintendent of Documents, Government Printing Office, Washington, 25, D. C. Prices of these chapters will be announced as soon as they are established.

Checking temperature and voltage of Hooker cells in the chlorine plants of Basic Magnesium, Inc., Las Vegas, Nev., is one of the many jobs contributing to the war effort now being handled by women. Chlorine, formed by electrolysis of salt water, is removed through the pipe at the top of each cell

Inflation in China Weakens Industry

Reporting from Chungking on Jan. 18, Brooks Atkinson, drama critic of the New **York *Times*,** says inflation in China has carried prices 200 times above their 1937 base, and that China faces the bleakest year of her long war with Japan. These high prices prevail, as far as is known, throughout China, and the cost of some manufactured articles has increased 500-fold.

Although crops have been fairly good this year, the only circumstance that enables China to continue resistance against Japan, industrial production is declining. Of the 364 machine factories in the Chungking area, 55 small units have closed down, 13 have curtailed operations, and more are expected to close by spring. Coal production rose about 10 percent in 1943, but all other mineral production is declining.

Tungsten production was cut 50 percent in 1943. It is estimated that it costs 80,000 Chinese dollars to mine a ton of wolframite and transport it to a shipping point. The United States is offering $1,600 U. S. Cy. for a ton of wolframite, the equivalent of 32,000 Chinese dollars.

Tin mining is also being adversely affected by this disparity between production cost and market price. In Yunnan, the Kechiu tin mine, which produced its maximum of 10,700 tons in 1938, declined to a new low of 2,000 tons in 1943. Only about 5,000 tin miners are still working; all the rest, numbering many thousands, have returned to work on their farms.

NaOH-Starch Mixture Aids Fluorspar Mill

Starch prepared with caustic soda was reported by Howard Winn, metallurgist for Continental Chemical & Ore Co., Silver City, N. M., to be an effective slime flocculator in floating fluorspar in his company's mill. This operation was described in the Dec., 1943, issue of *E.&M.J.*, and the text of the article referred correctly to the use of caustic soda with starch. In the caption for a table on page 106, however, the reagent combination was inadvertently printed as "starch prepared with Na_2CO_3." This should, of course, have read, NaOH.

Republic Steel Buys Chateaugay Mine

Republic Steel Corp., Cleveland, Ohio, recently announced purchase of Chateaugay Ore & Iron Co., Lyon, N. Y. The price was not revealed. This action was approved at a recent meeting of directors of the Delaware & Hudson Railway, who control 98 percent of the Chateaugay company stock through their subsidiary, Hudson Coal Co. The Chateaugay mine has been worked for about 75 years and has produced as much as 500,000 tons annually of low-phosphorus iron ore.

Reopen Gold Mines and Stockpile Metals, Denver Meeting Demands

Good Neighbor policy rapped as speakers call for end to discrimination against domestic producers and for continuance of premium prices

In an atmosphere heavy with resentment toward "the bureaucrats," mining men from all over the country attended the three-day joint session of the American Mining Congress, Western Division, and the Colorado Mining Association, in Denver Jan. 27-29. More than a thousand registered for the meeting, including a considerable number of representatives of government agencies from Washington. Principal bone of contention was the WPB order L-208, closing the gold mines, which mining men in general regard as destructive, discriminatory, both with respect to other industries and other countries, and a failure in achieving the objectives sought. There was also a notable undertone of apprehension over possible further cutbacks in mineral production and premium-price reductions which would jeopardize marginal mining activity brought into being by wartime demands.

Quite evident throughout the meeting was Western disapproval of the Administration's "Good Neighbor" policy, the typical attitude being that the government was preparing to sell domestic raw-material producers "down the river" in order to help out foreign countries against whose lower living and wage standards American producers could not compete. Sentiment was unanimously in favor of legislation to establish stockpiles of metals and minerals as a safeguard for a possible future emergency and to prevent a flood of accumulated mineral supplies from depressing the industry's markets. Majority opinion also favored the accumulation of such stockpiles exclusively from domestic sources, where possible.

Robert S. Palmer Reports

The meeting was opened by Robert S. Palmer, secretary of the Colorado Mining Association, who read a telegram from President Roosevelt commending the performance of the mining industry in meeting wartime requirements and during its continued application to the winning of the war. Palmer then read the resolutions of the Colorado Mining Association, which advocated a high level of domestic mining activity; resistance to changes in the mining laws currently being sponsored by the Interior Department; stockpiles built from domestic production; opposition to tariff quotas; recognition of deferred development expense in tax legislation; more liberal depletion allowances in the tax code; hard money; equal treatment of domestic and foreign gold mines; and continuance of present tariff rates. Palmer then read a telegram from Secretary Hull of the Department of State, congratulating the mining industry on its achievements and urging the convention to adhere to the provisions of the Atlantic Charter guaranteeing equality of access to the world's raw materials and trade, and looking to international accord.

In his annual report, Palmer opposed government regulation, described the activities of the association in helping to obtain government mining loans and public roads, criticized Secretary Ickes' attempts to levy royalties to pay for the Leadville tunnel, lauded the cooperative work of the U. S. Geological Survey, expressed faith in the mineral self-sufficiency of this country, opposed government wage-fixing policies, opposed tariff quotas, and demanded Colorado representation on any stockpiling agency that might be formed. Palmer also expressed the opinion that recognition of silver would solve the world's economic problems.

Great Aluminum Use Forecast

Paul P. Zeigler, Reynolds Metals Co., described the characteristics of aluminum alloys and predicted a great expansion in peacetime uses for aluminum. He prophesied that aluminum would make great headway in the field of electrical transmission, in structural parts where transportation or movement are involved, and in food-processing equipment. John D. Sullivan, of Battelle Institute, discussed the postwar future for heavy metals, predicting that future demands will eclipse all past records and that there will be large foreign requirements. He stated that there would be a great expansion of uses for steel clad with other metals, and that the fundamental copper problem will be to find enough metal; that copper would be a rare metal after twenty-five years. He predicted expanded uses for lead-coated sheets, heavier demands for galvanized goods and zinc die castings, and loss of most of the lead-silver solder market to high-tin solder. J. S. Williams and D. C. Cox, of the U. S. Geological Survey, described how detailed geological mapping of fluorspar properties has led to the development of important tonnages of fluorspar ore. Williams predicted that postwar demands for fluorspar would be about 200,000 tons per year. Richard H. Jahns, also of the U. S. Geological Survey, described work of the Survey on Colorado and New Mexico pegmatites.

At luncheon on the first day, H. C. Parmelee, Editor of *Engineering and Mining Journal*, discussed the postwar outlook for mining, predicting a period of prosperity after the war and a high level of mineral consumption. He described several problems facing this industry, including those of surplus stocks, tariff protection, and the necessity of technological improvement to overcome depletion and rising costs. Parmelee also predicted that all of the metals would retain their principal prewar markets.

Arthur S. Knoizen, director of the Mining Division of the War Production Board, described the efforts and accomplishments of his division in simplifying procedure and eliminating paper work. He explained that there was no intention of relaxing the gold-mine closing order for the duration of all-out war except where surplus labor is available and operation would not consume war materials.

Speaking on "The Gold Mine's Problem," Guy. N. Bjorge, general manager of the Homestake mine, bitterly criticized the gold-mine closing order, L-208. He described the damage to mining property, and the crippling of the town of Lead, S. D. He objected to unequal treatment of domestic and foreign gold mines and characterized the policy as inequitable with respect to other domestic industries. He urged cancellation of the closing order.

During the evening of Jan. 27, heads of the appropriate metal divisions of the War Production Board held conferences over copper-lead-zinc, ferro-alloy metals, and gold mining. All of these sessions evoked lively discussion and complaint over premium reductions, contract cancellations, and gold-mine closing. General producer opinion was strongly opposed to cutting back domestic production of minerals on which high-cost commitments are still being fulfilled from foreign sources.

Producers' Problems

Beginning the Jan. 28 sessions, Ray G. Sullivan, manager of Boulder Tungsten Mills, Inc., discussed "Problems of the Small Mine Operators." He described the small operator as caught between rising costs and fixed prices, with no protection from summary cancellation of contracts on short notice. He recommended continuation of present purchase programs until stockpile legislation is passed.

Ernest V. Gent, secretary of the American Zinc Institute, boasted of the "magnificent" accomplishment of the zinc industry in meeting war demands, including important tonnages shipped to allied countries. He urged the carrying of substantial stocks to meet industry emergencies, and the retraction of compulsory substitution of other materials, where zinc is normally used, now that supplies are adequate.

Speaking on silver, Carl J. Trauerman,

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- Keep the battery fully charged—but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.
- Record water additions, voltage and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings.

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secretary of the Montana Mining Association, urged continuation of the research program and a nation-wide educational campaign to bolster the monetary status of silver in the public mind. Trauerman expressed opposition to the "Good Neighbor" policy.

J. B. Haffner, general manager of Bunker Hill & Sullivan Mining & Concentrating Co., described lead supplies as adequate if producers are given an "opportunity." He characterized administrative measures in regard to manpower for the mines as ineffective and stated that an adequate price for 1941 was not adequate for the present, because of important increases in costs. Haffner opposed the creation of a new government bureau to handle stockpiles, and disapproved of the acceptance of foreign raw material as lend-lease repayments.

A paper by Blair Burwell, general manager for U. S. Vanadium Corp. at Grand Junction, Colo., described the strenuous efforts to develop adequate supplies of vanadium, which was considerably short of requirements earlier in the war. Plants of his company at Rifle and Uravan, Colo., were enlarged and new Metals Reserve Co. plants were built at Durango, Colo., and Monticello, Utah. By mid-1943 supplies had overtaken demands, and by the first of 1944 stocks were adequate for a year's needs. The two new Metals Reserve plants were shut down and all metals reserve purchases were discontinued. Limitation orders were relaxed to give civilian consumers full opportunity to obtain vanadium.

Charles H. Segerstrom, president of the Nevada-Massachusetts Co., outlined the almost miraculous accomplishments in providing adequate tungsten supplies to meet war needs, tungsten having been considered one of the most strategic minerals. He described the new plant at Golconda, Nev., where low-grade scheelite ore is treated chemically without prior concentration. Segerstrom did not consider the twenty million pound stockpile excessive in view of consumption of a million and a half pounds per month, and advocated continuation of domestic production.

No Relief in Manpower

Addressing the meeting on the subject of "Manpower for the Mines," Brigadier General W. C. Rose, of the War Manpower Commission, emphasized that it was easier to criticize than to find solutions. He itemized the armed and labor services necessary to the war effort, adding up to more than sixty million, and stated that the armed forces would reach peak size by June 1. From that time forward needs would be for replacements, consisting of about 150,000 per month, of which only 50,000 could be obtained from youths reaching military age. His general conclusion was that there was no surplus of manpower in sight. The general stated that the mining industry of the West had had more special consideration than any other, and that no obvious solution to the manpower problem of the mines was available. He stated that there would not be any more release of soldiers to industry and that cutbacks would probably not result in a net gain because of expansion in other industrial requirements and the needs of the armed forces for men. He urged the mine operators to continue to make the best of what they had, with partciular attention to housing, transportation, parking, food, schools, and the selective service problems of the employee.

After the noon recess, Julian D. Conover, secretary of the American Mining Congress, read a telegram from Donald Nelson, chairman of the War Production Board, complimenting the mining industry on its war achievements and urging a continued effort of like character.

Bunker Asks Cooperation

Addressing the meeting on the subject "Some Major Problems in the Field of Minerals and Metals," Arthur H. Bunker, newly appointed Vice Chairman for Metals and Minerals of the War Production Board, stressed the difficulty of the task ahead. Calling attention to the slowness of democratic processes, he stated that much preliminary discussion would be necessary to write future policy. He sketched the history of the effort which built up the country from a state of woeful unpreparedness to one of military adequacy, including the building up of deficient mineral supplies, and stated that although ideas on present surpluses were somewhat exaggerated, the surpluses would probably grow. Labor and plant capacity, particularly the former, are not available to consume important amounts of surplus minerals even if limitations on consumption are relaxed, as long as all-out war is in progress. The speaker said that some further curtailment of production of certain minerals is probably indicated, particularly in view of the manpower prospect.

After the war in the European theater is ended, Bunker said, war production could probably be reduced 30 percent or more, which would probably make it possible to release important amounts of surplus metal for civilian consumption.

The most difficult problems will come when the war is entirely over. Then there will be the necessity of developing new resources to make up for the extensive depletion caused by war needs, and necessity of working out a stockpile program to prevent surplus metals from wrecking the markets. Calling attention to the vast needs for reconstruction which must be financed, he stated that payment must be accepted in part as raw materials, and that such inventories must be prevented from disrupting domestic markets.

Bunker called attention to the necessity of a program of ascertaining the nation's mineral resources in more detail and in devising means for their effective utilization. He indicated that such research might logically call for considerable government activity, but made plain his belief that the job of development and production should be done by private enterprise, to which the citizens of this country are quite evidently inclined.

In closing, Bunker stressed the need for early solutions and the fullest possible cooperation by all concerned.

The session on the second afternoon was devoted to federal taxation. Henry B. Fernald, chairman of the tax committee of the American Mining Congress, gave a general view of the federal tax picture, and stressed the vital need for broad "grass-roots" support of the mining viewpoint on tax problems. J. M. Bowlby, president of the Eagle-Picher Lead Co., compared the relative tax burden in this country and Great Britain, stating that income taxation in this country was higher because dividend income was taxed both as corporate and personal income. He stated that the corporate and middle and higher personal income groups were already taxed to the point of diminishing returns and that any further increase in tax revenues would necessarily have to depend primarily on the income group receiving less than $5,000 per year.

Leo J. Hoban, secretary of the Hecla Mining Co., analyzed the special features of the new revenue bill pertaining to mining, calling attention to the extension of percentage depletion to certain minerals and to new provisions affecting the computation of normal income for excess profits tax purposes. S. H. Williston, vice president of Horse Heaven Mines, Inc., criticized attempts of the Treasury to emasculate depletion allowances to quicksilver producers, stating that except for amendments in the revenue laws which forbade this practice many quicksilver producers would have been forced into uneconomic operations which would have impaired the nation's mercury production.

Self-Sufficiency Stressed

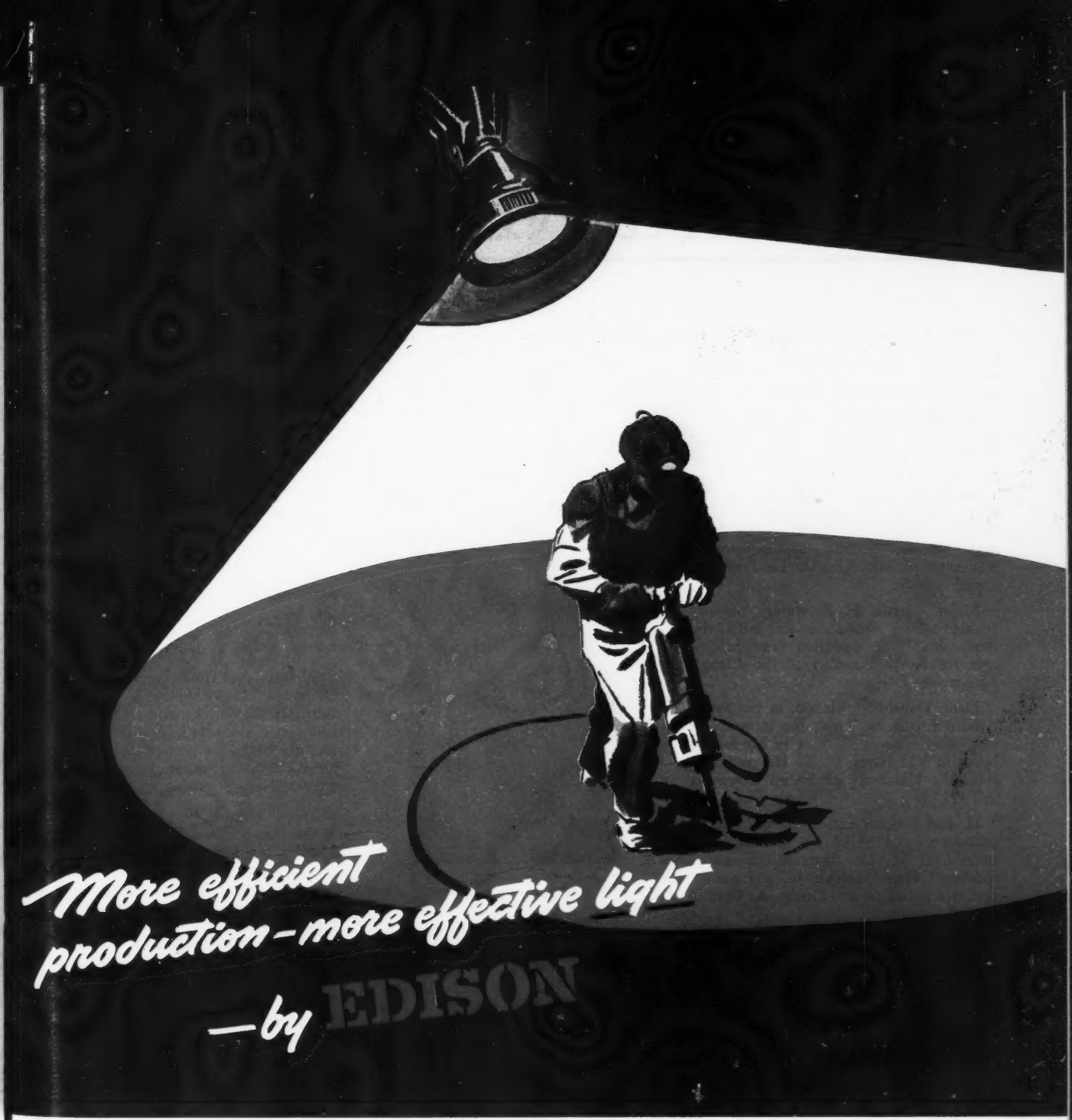
Speaking at the silver banquet, Mortimer Stone, attorney of Fort Collins, Colo., made an eloquent plea for the principles of *laissez faire*. He strongly opposed any solution of foreign trade problems at the expense of American raw-material producers, and stood for maximum domestic self-sufficiency.

At the morning session on the last day, Telfer E. Norman, metallurgical engineer for Climax Molybdenum Co., described properties of new molybdenum steels and their application to uses where resistance to wear is an important feature. He foresaw the increased use of locally cast molybdenum steel grinding balls, which seem to have particular advantages where mill feed is low in quartz.

A paper by Dr. G. F. Loughlin, chief geologist of the U. S. Geological Survey, described the activity of the Survey in finding new ore reserves, stressing the need for a national survey of mineral resources and for detailed geological studies. He also advocated studies of mineral, rock, and structural associations connected with ore deposition as a means of outlining favorable and unfavorable areas for more detailed investigation.

Dr. John Lee Coulter, economist and former member of the Tariff Commission, discussing "Tariff and International Trade," stated that the most practical assurance of a healthy world economy is a strong domestic economy in the United States, and that it is impossible for the United States to feed the world or guarantee world prosperity. His opinion was that domestic prosperity would demand pros-

(*Continued on page 164*)



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PERSONAL NEWS

John A. Austin is reported to be in charge of driving a long tunnel at the Black Bear mine, at Ouray, Colo. The mine is an historic gold-producing property.

Fayette Brown, Jr., has been transferred from the Cleveland-Cliffs Iron Co.'s Hibbing office, on the Mesabi, to the company's Cleveland office.

Harry O. King resigned as director of the Copper Division, WPB, effective Feb. 1. He will return to private business. **Michael Schwarz,** deputy director, will succeed Mr. King as head of the copper section.

Major Claude F. Browning, recently released from active service with the Army, has been appointed general manager for North Carolina of the Clough Manganese Corp.

Lieut. Donald McKinnon, of the South African Engineers Corps, has returned to duty after a six-weeks' visit to his former home in Vancouver, B. C. He graduated from the University of British Columbia in 1937.

H. Earl Farnam was on Jan. 17 elected president for 1944 of the Duluth Engineers Club at that organization's annual meeting. **Hugo Schlenk, Jr.,** was elected first vice president and **George A. Corine,** second vice president.

Donald B. Douglas has been elected president of the International Mining Corp., succeeding **H. W. Chadbourne,** who has become chairman of the board.

M. A. Skovera, recently with the U. S. Engineers Corps., has joined the staff of Pickands, Mather & Co. at Ironwood, Mich.

Lawrence Woodworth, of the Ironwood (Mich.) engineering department of Pickands, Mather & Co., formerly at Newport iron mine, is now engineer of the Carey iron mine, on the Gogebic Range.

Frank G. Pardee, mining engineer and State Appraiser of Mines, has been granted leave by the Michigan Geological Survey Division to assume the post of adviser to Peru on the establishment of an iron and steel industry in that republic.

Dr. Edward L. Clark, regional technical adviser of the WPB mining division, has been appointed as acting manager of the Joplin district office of the War Production Board. He succeeds **William H. Woestman,** of Carthage, acting manager of the district office.

George A. Warner is in charge of the fluorspar operation of Zuni Milling Co. near Grants, N. M. Shattuck Denn has acquired the Zuni property. Mr. Warner was recently in charge of 79 lead-copper mine, at Hayden Junction, Ariz., also controlled by Shattuck Denn.

Arthur A. Center has returned to New York after an absence of several months, during which his headquarters were in San Francisco, though numerous business trips took him to most of the Western mining districts.

Enoch Perkins has been elected vice president of the Mutual Chemical Co. of America, in charge of the company's mining and ore department. Mr. Perkins has had wide mining experience.

ENOCH PERKINS

In recent years, in addition to supervising the company's mining operations in New Caledonia, he has visited the South African fields in Rhodesia and the Transvaal, as well as the rich Turkish mines.

Howard Kegley, has been elected president, **H. W. Howe,** first vice president, **Dr. John Herman,** second vice president, and **Victor Hayek,** secretary, of the Mining Association of the Southwest.

Fred V. Seibert, counsellor of the Canadian Institute of Mining and Metallurgy and Industrial Commissioner of Canadian National Railways, has been elected president of Manitoba Chamber of Mines. He is a graduate in engineering from the University of Toronto.

George C. Bateman, long distinguished in Canadian mining circles and now Canadian Metals Controller, has been made a deputy member of the Combined Production and Resources Board and will assume charge of the Board's office in Washington, D. C.

Theodore Pilger has completed his recent assignment in Mexico and has just returned from a month's tour of the Central American republics. He may now be addressed at his home, 771 Stanford Ave., Palo Alto, Calif. Mr. Pilger reports that work on the Pan-American Highway is progressing and that mining, particularly of gold and silver, is on the increase.

Rodgers Peale, mining geologist, has opened an office in San Francisco.

Louis A. Wright, consulting engineer, Palo Alto, Calif., is in Peru, S. A., on business.

E. G. Day has been elected president of the Marquette Range Engineers for 1944. **Lawrence G. Collins** has been made vice president; **Frank Masek,** treasurer; **Burton Boyum,** secretary; and **E. H. Hayden** and **C. J. Myron,** directors.

W. S. Boyd, vice president of the Kennecott Copper Corp., has been at the McGill and Ruth properties of the Nevada Consolidated Copper Corp., Kennecott's Nevada division.

Richard N. Hunt, geologist for the U. S. Smelting, Refining & Mining Co., and **Jack Nevell,** superintendent of that company's Gold Hill property in Utah, recently visited the Richmond-Eureka Mining Co. properties at Ruby Hill, near Eureka, Nev.

Ernest Blessing, formerly of Santa Fe, N. M., has been named assistant to **James McKim,** of Miami, senior mining engineer of the U. S. Geological Survey, who supervises the leasing of Indian lands in the Oklahoma section of the Tri-State mining district for the government. Prior to assuming his duties in the district, Mr. Blessing was with the Survey's topographic branch in the Pacific division, and previous to that served in the conservation branch of the Survey.

Dr. Marcellus H. Stow, deputy director of WPB mining division, visited Tri-State mining men and local WPB officials Jan. 14. He went underground at the Eagle-Picher Blue Goose mine, toured the Central mill, and visited open-pit mines at Webb City and Oronogo. He also was a guest of mine operators at a special luncheon meeting of the Cortez Club at Picher.

E. G. Schoeffel, who has been in charge of the Mead reduction plant of the Aluminum Co. of America, near Spokane, Wash., since the plant began operating, has been transferred to Pittsburgh to become manager of all reduction plants for Alcoa. **W. M. Farquhar,** manager of Alcoa's reduction plant at Modesto, Calif., has been named as Schoeffel's successor.

G. E. Abernathy, of Pittsburgh, district geologist for the Kansas State Geological Survey, was elected chairman of the Tri-State section of the A.I.M.E. for 1944 at a meeting of the local section's new directorate held Jan. 19 in the offices of the Tri-State Zinc & Lead Ore Producers Association in Picher. He succeeded

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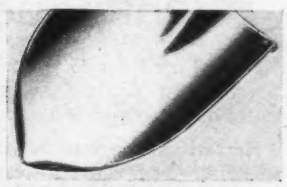

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Victor C. Allen, of Joplin. Other officers named were **H. H. Utley,** of Baxter Springs, vice chairman, and **A. J. Martin,** of Joplin, secretary-treasurer. Besides the officers, other members of the new board of directors are **George M. Fowler** and **W. F. Netzeband,** of Joplin; **L. G. Johnson,** of Baxter Springs; **S. S. Clarke,** of Miami, and **Frank Cuddeback,** of Commerce.

J. W. Still, mining engineer, has resigned as general manager of Bagdad Copper Corp., operating at Hillside, Ariz. His current address is P. O. Box 1612, Prescott, Ariz.

J. O. Elton, who retired on Jan. 1 as manager of the International Mining & Smelting Co., was guest of honor at a banquet attended by a hundred business, mining, and professional men at the Alta Club, held at Salt Lake City, Utah, on Jan. 11.

L. M. Becker, Hibbing, Minn., instructor in mathematics of the Hibbing High School, has been elected president of the Engineer's Club of Northern Minnesota. **Gyle B. Pyles,** Hibbing, Minn., superintendent of maintenance at Hibbing for the Oliver Iron Mining Co., was elected vice president, and **H. E. Reese,** mining engineer with Butler Brothers, Cooley, Minn., was elected secretary-treasurer.

Micheal P. Walle, Hibbing, Minn., formerly research engineer with the Division of Lands and Minerals, State of Minnesota, has joined the staff of the Cleveland-Cliffs Iron Co., Hibbing, Minn., as research engineer.

L. S. Breckon, for ten years Utah Copper Co. mine geologist at Bingham, has been appointed field engineer for Kennecott Copper Corp. He will continue to supervise the geological work of Utah Copper besides making mine examinations for the parent company. Mr. Breckon is a native of Salt Lake City and a graduate of the University of Utah. He will continue to make his headquarters at the Bingham Canyon property for the present.

Obituaries

Harry Tyrrell, for 25 years active in mining circles in Western Australia, died recently in Kalgoorlie at the age of 62.

Herbert Warington Smyth, a British mining engineer active in Siam and South Africa, died on Dec. 19, 1943. He was 76.

Orra I. Deschon, editor of *Montana Oil and Mining Journal,* and who for the past 20 years had been associated with mineral production in Montana, died recently at the age of 50.

Frank E. Peterson, 51, secretary-treasurer of the Galigher Company, died at Salt Lake City Jan. 18. He had been associated with the Galigher Company for more than 30 years. A native of Salt Lake City, he served overseas in the first World War with the 145th Field Artillery.

Dr. Edward Bennett Mathews, 74, professor emeritus of mineralogy and petrography at Johns Hopkins University, former State Geologist of Maryland and member of the Maryland Board of Natural Resources, died at Baltimore on Feb. 4.

John L. Keenan, for 25 years general manager of Tata Steel & Iron Co. at Bombay and Jamshedpur, India, died early last month at a U. S. Army hospital in China, where he had gone about a year ago as a representative of the State Department. He was 55.

Alfred Christian Garde, a consulting mining engineer long prominent in mining development in British Columbia, and formerly associated with F. Augustus Heinze and Marcus Daly, died recently in Vancouver. B. C.

Daniel Mayne, who had been operating the Ash Peak (Ariz.) lease with **Howard Mottier,** of Duncan, died in mid-November.

Greene Bolin, a resident of Arizona since 1889, and the first State Mine Inspector, died Dec. 1 last at Phoenix at the age of 67. On coming to Arizona he settled in Bisbee, where he was with the Phelps Dodge Corp. Appointed mine inspector by Governor G. W. P. Hunt, he served for nine years.

Alexander Kidd, an old-time Bisbee mining man, died at his home in Bisbee on Jan. 11 at the age of 74. Mr. Kidd came to Bisbee 41 years ago and for several years was in the employ of the Phelps Dodge Corp.

Israel O. Proctor, mill superintendent for Lava Cap Gold Mining Corp., Nevada City, Calif., died recently after a prolonged illness at the age of 59.

Lawrence Monte Verda, vice president of Carson Hill Gold Mining Corp. and president of California Electric Steel Co., died in Altaville, Calif., on Dec. 17, 1943, age 70.

Arthus B. Thomas, well-known Utah mine operator, died recently in Oakland, Calif., at 72. Mr. Thomas' recent mining venture was the operation of the Sierra Nevada property, near Virginia City, Nev.

John F. Coats, mining engineer, died in Vancouver on Dec. 29, 1943. He was formerly on the staff of the Granby Consolidated Mining, Smelting & Power Co., Ltd. He was born in Battle Creek, Mich., and was a graduate of the University of Michigan.

George Birkenstein, president of George Birkenstein & Co., Chicago, and a prominent figure in the secondary metals field, died Jan. 2 after a long illness. He was 44 years old.

S. F. Hoffenberg, senior assistant in the department of mining engineering and surveying in the University of the Witwatersrand, died on Nov. 17 last. Mr. Hoffenberg received his education at the University of the Cape of Good Hope and Witwatersrand University. He had been active in mining circles in South Africa for many years.

Henry L. Williams, formerly president and general manager of Hillside Mines, Inc., and associated with the operations of the Davis-Dunkirk Mines and Bradshaw Mines, Inc., died recently at the home of his partner, **James W. England,** in Phoenix, Ariz.

Owen Letcher, for many years editor of the *South African Mining and Engineering Journal,* founder of the *Mining and Industrial Magazine of Southern Africa,* and also an author of note, died recently in his 60th year. Mr. Letcher served in the war of 1914-1918 in both Southwest and East Africa. He was a graduate of the Redruth School of Mines, in Cornwall, and a member of the Institution of Mining and Metallurgy, of London.

Guy C. Howard died Dec. 19, 1943, at the age of 65. Early in his career he was chemist for the American Smelting & Refining Co., first at Perth Amboy, N. J., and later at Salt Lake City, Utah. From 1916 to 1920 he was in charge of recovery of sulphur products from metallurgical gases at the same company's plant at Tacoma, Wash. At the time of his death he was in charge of special development work for Marathon Paper Mills Co., Rothschild, Wis.

A Letter

Michigan Copper Centenary

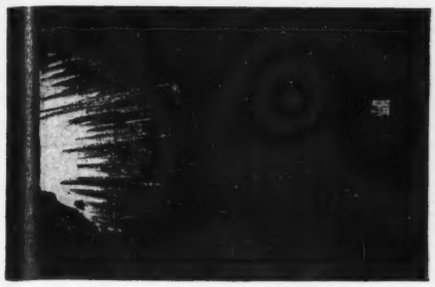
The Editor:

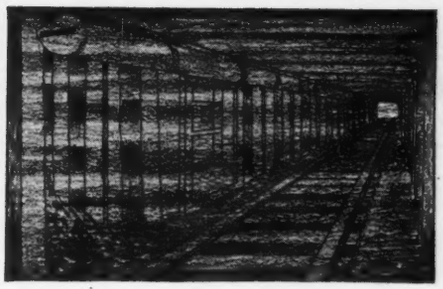
IN THE DECEMBER ISSUE of *E.&M.J.* under the mining news of Michigan is some vest-pocket history of the approaching centenary of mining in the Wolverine State. It is, of course, most interesting, and I presume as accurate as anyone can make it; however, there seems to be one of the early copper mines left out of this array of pioneer mining ventures. There was, I believe, a copper property known as the Ogemaw mine, which evidently was in active production around 1850. An uncle, John G. Berry, was its superintendent and my father had a contract (he was ever a free lance and would "wear no man's collar") for supplying the lagging and other timber material. The location of the mine was probably in the neighborhood of Ashland, Wis., or between that town and Ontonagon. If I am not exactly right in quoting this name, some old-timer will put me right.

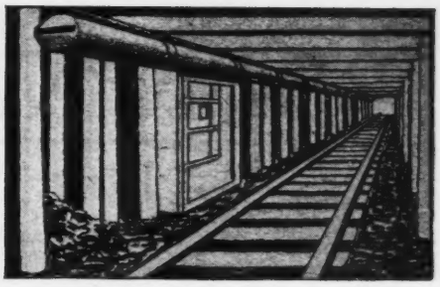
A little incident sets the time for me fairly well. My father, so the story goes, became well acquainted with the superintendent of a new copper mine that was trying to get under way—the Calumet & Hecla—and the going evidently was rough. This C.&H. superintendent tried very hard to get my father to buy a block of the shares of that young company, at the price of fifty cents per share. My parent refused, being somewhat wary of "those wildcat" companies.

C. R. BERRY

Seattle, Wash.







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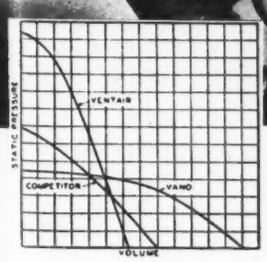

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REGIONAL NEWS

Old workings at the 230-ft. level of a Tri-State mine have been converted into an open pit by Oronogo Mutual Mining Co. Floods last May filled this pit, and mining was not resumed until late October, when the last of the water was pumped out

CALIFORNIA

Grey Eagle chrome mine to close —New road for Shasta County mine—Strawberry mine produces tungsten

▶ Operations at the Oxford chrome mine, near Downieville, Sierra County, have been suspended for the winter because adverse weather conditions have closed the road to the pit, preventing movement of ore to the mill. Current plans include driving a crosscut from No. 4 tunnel to an area expected to contain good ore. The property is operated by C. L. Best, of San Leandro, who also owns the Ruby drift gravel gold mine, south of Downieville, closed since issuance of the WPB gold mine closing order. Operations at the Oxford and Ruby mines are under the direction of L. L. Huelsdonk, general superintendent, and currently 11 men at the former and 3 men at the latter are employed on development work.

▶ According to word received from Willows, the Grey Eagle mine, in Glenn County, one of California's largest chrome producers, which is operated by Rustless Mining Corp., is to be closed down on Feb. 15. The property was operated during the first World War, and was reopened by the present operators about two years ago. The chrome deposit was mined by open-pit methods, and the ore was treated in a 200-ton gravity concentrator.

▶ The Shasta County Board of Supervisors has approved a contract with the federal government for the construction of a roadway to Iron Mountain, where Mountain Copper Co., Ltd., operates the Hornet mine. Its purpose is to facilitate haulage of strategic minerals from this area.

▶ Production of tungsten is reported to have started at the Strawberry mine, in the Granite Creek district of Madera County, following construction of a milling plant. Considerable development work has been carried on at the mine in recent months, disclosing a good tonnage of commercial scheelite. James C. Perkins is general manager and W. P. Lenhart plant superintendent.

▶ Imperial Metals Development Co., of Los Angeles, is reported to be planning to resume mining operations at the Cerro Gordo group of lead-zinc-silver properties in Inyo County. Known zinc deposits are to receive primary attention.

▶ Four more gold properties situated between present holdings at Alleghany, Sierrra County, and the town of Forest have recently been acquired by the Original Sixteen to One Mines Co., H. U. Maxfield, president. The company's mine, equipped with a 150-ton mill, has been on a maintenance basis since WPB's gold mine closing order. C. A. Bennett is general superintendent.

NEVADA

BMI still expanding — Getchell mine treats MRC tungsten ore—Copper Canyon mine reaches capacity

▶ Basic Magnesium, Inc., Las Vegas, has been authorized by Defense Plant Corp. within the past month to spend $108,000 for hot-metal transport equipment, $60,000 for hospital additions, and $49,000 for building improvements. J. O. Case, manager, reports that the one hundred millionth pound of magnesium metal was poured on Jan. 20 in the No. 8 unit of the Clark County plant, now producing substantially above rated capacity. Mr. Case also reports that the new town of Henderson, housing BMI employees and named for Charles B. Henderson, RFC chairman and former U. S. Senator from Nevada, is now the third largest town in Nevada.

▶ Mountain City Copper Co. will pay a dividend of 10c. per share on Feb. 27 to stockholders of record Jan. 27. Last dividend, of 15c., was paid Jan. 4, 1943. The company, controlled and operated by International Smelting & Refining Co., an Anaconda subsidiary, operates a 350-ton flotation mill in the Cope district, northern Elko County.

▶ Scheelite from a Metals Reserve stockpile of over 20,000 tons in the Potosi district, Humboldt County, is being trucked to the nearby tungsten concentrator of the Getchell mine, supplementing that company's product, mined a short distance from its gold workings. Some ore has been received from claims worked by W. C. Rigg under lease from the U. S. Vanadium Corp. Stockpile ore has come from properties of Joseph E. Riley and of the Harold's Club Mining Co., the former now delivering 200 to 300 tons of open-cut scheelite daily.

▶ Having reconditioned a 50-ton flotation mill at Grantsville, northwestern Nye County, the newly formed Rex Mining & Milling Co., headed by R. B. Dickey, Reno, is shipping high-grade lead-zinc-silver concentrate and is providing additional cells for selective flotation. The

When a mine superintendent says, "You can't beat the Schramm Air Compressor we have—it's so versatile!"—it becomes an important statement.

Because, based on a survey by Schramm, Inc., the value of an air compressor in coal mines depends largely on its versatility.

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Compressor and engine are coupled together as a perfectly aligned, vibrationless unit

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Valves operate from cam in perfect timing with crankshaft and piston travel

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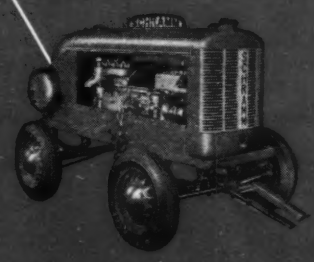


Nevada *(continued)*

mine, with around $800,000 past production, was opened in 1863 and equipped with a 40-stamp mill by the Alexander Mining Co. During the '20s it was operated with substantial production by W. J. Webster, of Wilmington, Del., head of a DuPont subsidiary, in association with the late Seeley Mudd, of California. New mill equipment was installed in 1939 by the Silver Palace Mines, Inc., headed by Capt. W. J. Barrows, pilot of transpacific planes.

▶ Drill equipment and crews are at Coaldale, northern Esmeralda County, prepared for extensive drilling of coal beds on the H. A. Darms property, on which the U. S. Bureau of Mines has stripped long stretches of outcrops by means of bulldozers. R. S. McClintock, of Spokane, Wash., has the drilling contract from the Bureau of Mines, and $40,000 has been allocated for the work, expenditures to be made through the Nevada district office, headed by Glenn L. Allen at Reno. Several shafts have been sunk to 200 and 300 ft. on the four flat-dipping beds, from 4 to 30 ft. in thickness. Three carloads of the bituminous coal, shipped to the Northwest plant at Seattle for dressing tests, indicated high heat value, suitable for producer, fuel, or illuminating gas, according to a report by Dr. H. F. Yancey, supervising engineer. Known as the Nevada project of the Bureau of Mines coal division, the project is in direct charge of Vard H. Johnson, resident geologist. Walter S. Moore, engineer from the coal division's Pittsburgh station, and D. A. Andrews, western coal specialist for the U.S.G.S., have been active in preliminary work.

▶ Operation by the International Smelting & Refining Co. of its 350-ton flotation mill on leased property of the Copper Canyon Mining Co. in Lander County is now on a capacity basis, a full complement of men having been obtained recently. Orebodies exposed in drilling are being mined on and above the 500-ft. level of the new Julie shaft, and deeper drilling is to be undertaken. L. E. Whicher, New York, is president of Copper Canyon Mining Co. and J. J. Lillie is resident manager for International at Battle Mountain as well as at Mountain City.

▶ One of the oldest mines in the Peavine Mountain district, the Golden Fleece, 7 miles north of Reno and a producer at long intervals since the early '60s of ore containing gold, silver, copper, lead, and zinc, has been reopened by Capt. W. M. Awbrey and associates, who are working through a long tunnel and 120-ft. incline shaft, with adequate equipment. George Frasher is superintendent.

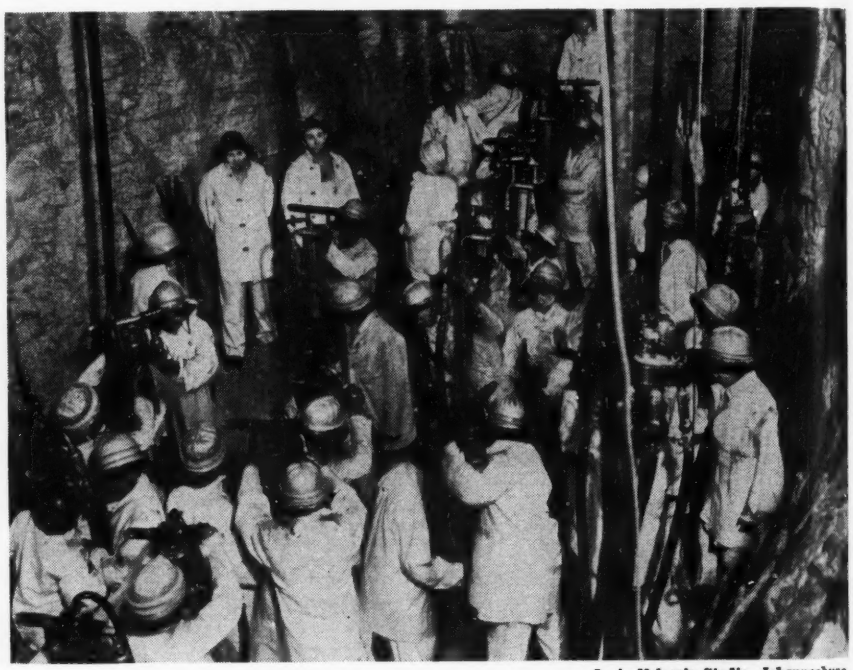
▶ The copper pit at Ruth, White Pine County, source of ore for the 22,000-ton concentrator and smelter of the Nevada Consolidated Copper Corp., Nevada division of Kennecott Copper Corp., has produced 95,000,000 tons of ore, entailing removal of 125,000,000 tons of waste overburden, according to a report by Matt Murphy, State Inspector of Mines. Former shortage of labor has been largely relieved and production is near capacity, the ore supply including 9,000 tons per day from the Kimberly underground mines of the Consolidated Coppermines Corp.

▶ Current reports indicate that operation of a 1,000-ton plant built at the Three Kids mine, in Clark County, for Defense Plant Corp. by Manganese Ore Co., M. A. Hanna subsidiary, has not succeeded in reaching capacity. The process used, involving sulphur dioxide leaching of low-grade manganese ore, is entirely new and many operating difficulties remain.

ARIZONA

New mine developed near Castle Dome—Fluorspar flotation plant planned—Leviathan road opened

▶ C. Benjamin Hayes, of Wickenburg, is reopening the old Unida property, in the Black Rock district, east of Wickenburg, owned by N. S. Oberan, of Wickenburg. Equipment is being installed preparatory to shipping ore. Hayes is operating the mine under lease.



J. A. Nelson's Studio, Johannesburg

Waiting for the word "Go" are these drillers, engaged in sinking a shaft in the West Vlakfontein gold mine, on the Rand, in South Africa. Note safety factor of hard hats piled four deep on most heads, and deep dents in hats worn by two men at left

▶ Copper ore is now shipped at a rate of over 100 tons per day from the Greenan-Kerr mine, at Majuba Hill, Pershing County, to the Garfield, Utah, smelter of the American Smelting & Refining Co. Development on the middle tunnel level is said to have established a 100-ft. width of ore, now broken over a width of 30 ft. A crew of 40 men is employed under the direction of James O. Greenan, Reno, and six heavy-duty trucks make two round trips per day to the loading ramp at Imlay on the Southern Pacific main line. Drilling is to be resumed in the tin-bearing section of the mine.

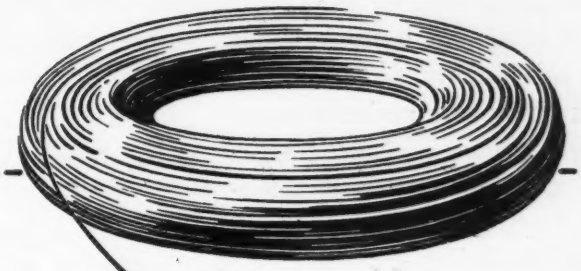
▶ A carload of scheelite has been shipped to the Metals Reserve tungsten plant at Salt Lake City from property near the Carson river, 6 miles from the state capital, developed recently by Carson City men and worked under lease by Joe Vesco, also of Carson.

▶ J. A. Campbell, owner and operator of the Big Spar and Contact Spar mines, in the Vulture mining district, in Maricopa County, is planning to secure additional financing from the RFC for the purpose of installing a 75-ton flotation plant for fluorspar ores.

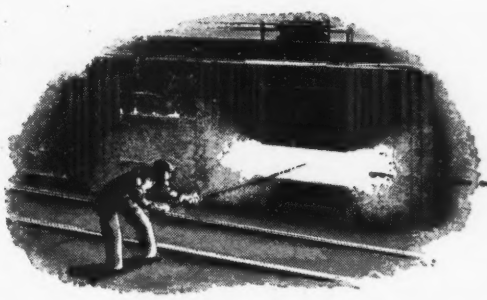
▶ The White King Mines is the title of a limited partnership composed of William Cole, Craig T. Dobkins, and Ray Seidletz, of Superior, who will operate the White King and Lobb properties, near Superior, the Dobkins mine, in the Owl Head district of Pinal County, and the D.S.C. group, in the Whetstones. Craig T. Dobkins, Superior, will direct operations.

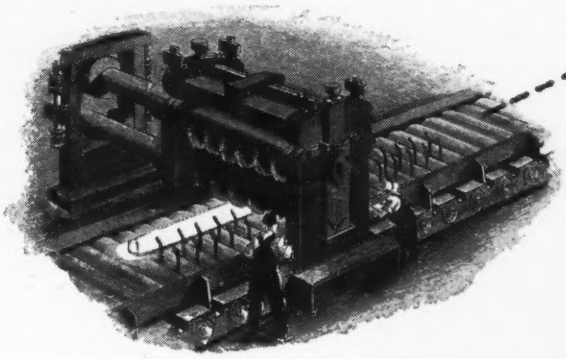
▶ The Old Dick mine, in the Eureka district near Hillside, has been leased to E. George Green, chemist for the Bagdad Copper Corp., at Hillside. Harry O. Monasmith, John Hegwood, Jim Lovett, of

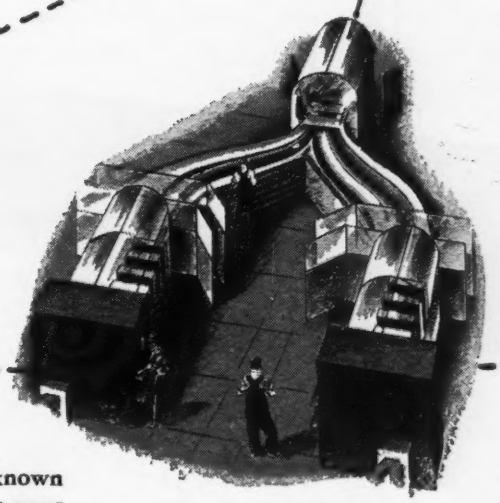
Open hearths, blooming mills, rod and wire mills, all aimed in one direction... the production of specialized wire ...the best we can make...



ROEBLING "Blue Center" STEEL WIRE ROPE







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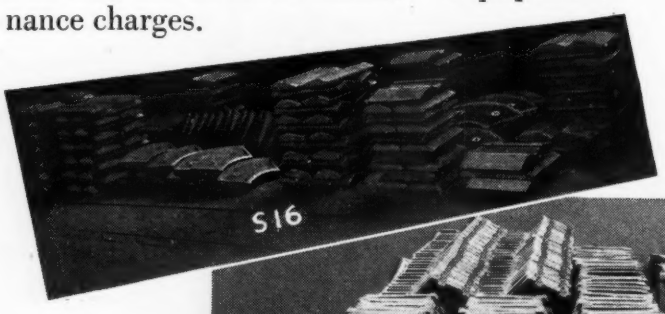
Ask for Bulletin 1141-L on Ball Mill Liners and Bulletin 743-M on Manganese Steel in Mining and Quarrying Equipment.



S-16. 36 tons of manganese steel shell, manhole and end liners for 6'x8' and 5'x7' rod mills.

513-4. 112 outside and 50 inside end outlet grates for ball mills used in grinding gold ore, total weight 40 tons. They were machine ground on top surface to true them up, something unusual in ball mill grates.

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Arizona *(continued)*

Hillside, and R. R. Belknap, Prescott, are associated with Green in the operation of the mine.

▶ Norman Rehg, of Tucson, president of the Keystone Copper Mining Co., reports that rehabilitation, financed by an RFC loan, is in progress at the O.K. and Hagerman shafts on the Keystone property, near Dragoon in Cochise County. The 475 and 600 levels of the Hagerman shaft are being made accessible for sampling before work is started in the O. K. shaft.

▶ Patagonia Metal Mills plant, in Patagonia, is being enlarged by the St. Louis Mines Co., a limited partnership composed of Oscar G. Hogsett, Patagonia, and F. G. Waller, Ladue Village, Mo. The plant will be used to treat ores from the Patagonia Mills property, in the Harshaw district, which has been leased to Hogsett and Waller.

▶ The Matchless mine, owned by John P. Holman, Phoenix, and located in the Big Bug district of Yavapai County, has been leased to John W. Buhler, of Mayer, who has completed a road to the property. The shaft is being rehabilitated preparatory to mining silver-lead ore.

▶ The Moore group of patented claims in the Plomosa district of Yuma County has been sold by Erven Brewer, of Santa Clara, Calif. to E. M. Marshall, Vicksburg, Ariz., who plans to ship copper-silver ore to Clarkdale. At present three men are employed in rehabilitation.

▶ J. D. McClintock, Miami, and John Alexander, Phoenix, are developing the Schulze mine, south of the Castle Dome mine, in the Miami district. A considerable amount of work has already been done on the property, consisting of churn drilling, tunnels, shafts, and trenching. The average tenor of the copper ore indicated is about 1½ percent.

▶ The old Blue Bell mine, in the Big Bug district, near Mayer in Yavapai County, is being reopened by E. J. Bumstead, who is planning to mine a large body of low-grade copper fluxing ore. The Blue Bell has been idle for many years.

▶ The Belmont-McNeil lead-copper property, in the Palo Verde district of Maricopa County, owned by Economy Mining Co. and leased to Pierre Perry, of Mayer, has been subleased to E. R. Dickey, president and general manager of the East Vulture Mining Co. The last operator at the property was G. F. Reed, Willcox, Ariz.

▶ The holdings of Pine Top Asbestos Co., 37 miles northeast of Globe, have been taken over by Southwestern Asbestos Corp., incorporated by Jacques S. Michault, of Globe, formerly general manager of the Pine Top operations; George H. Rhinehart, of New Paltz, N. Y., and Samuel B. Wasserman, of New York, N. Y. In addition to the operation of a purchasing agency for asbestos and a processing plant at Globe, the new company will develop other properties in the district. The entire output of the Southwestern plant will be sold to Asbestos, Ltd., of New York.

▶ The Leviathan mine, Mohave County

molybdenum and copper producer, has been provided with a new 14-mile access road built by the Grazing Service, according to a recent report. The new road connects the mine with the road from Yucca, and it also will be of assistance to other prospects and mines in the area and to the cattlemen of the district.

▶ The Abril mine, near Tombstone, in Cochise County, which has been operated under an RFC loan by Walter Sim and Mrs. Henriette Miller, of Tucson, has been leased by Dan Lewis and Adrian Skinner, of Willcox. Copper, zinc, gold, and silver are found in the ore.

COLORADO

Work begins on Leadville tunnel —San Juan mine strikes rich ore—Treasury tunnel progresses

▶ Actual work on the Leadville tunnel began in December, with over 100 men employed under the direction of John Austin, of Stiers Brothers Construction Co. Some of these men were transferred from other construction jobs in the State and some were Leadville citizens. Key men on the tunnel work are expected to be housed in a large government housing project, completed in Leadville last summer. The main tunnel is to be over 17,000 ft. long and will extend from the east fork of the Arkansas River to the Pyrenees shaft, cutting this shaft at approximately 800 ft. Laterals will branch to the Tucson and Penrose shafts. An area of eight square miles around Leadville has been closed to mineral entry to prevent a speculative boom. The land withdrawn comprises six sections along the line of the tunnel and also fractions not covered by patented claims. It is hoped that this tunnel will be completed within 555 days.

▶ The sum of $1,172.94 was realized from the sale of the two cars of ore donated to the War Chest Fund from the Cripple Creek district, according to T. E. Wade, of Cripple Creek. The Golden Cycle mill and the Midland Terminal railroad donated the treatment charges and freight.

▶ The John Hamm mill at Leadville is operating three shifts and employing about 20 men. Dump ores from the Maid of Erin, Henrietta, and Fanny Rawlings mines are being treated in the 300-ton flotation plant. The 600-ton jig plant will be ready for operation shortly, and then the operation of the flotation mill will be either suspended or greatly curtailed. John Hamm, manager, has a large tonnage of ore in these dumps and should be ready to take newly mined ores from operations following the driving of the Leadville drainage tunnel.

▶ George Huber, of Idaho Springs, is now mining gilsonite deposits in northwest Colorado. His company has a large vein of gilsonite in almost pure form and worth about $35 per ton. The mineral, a variety of asphalt, is a non-conductor of heat and electricity and is used in paints and varnishes.

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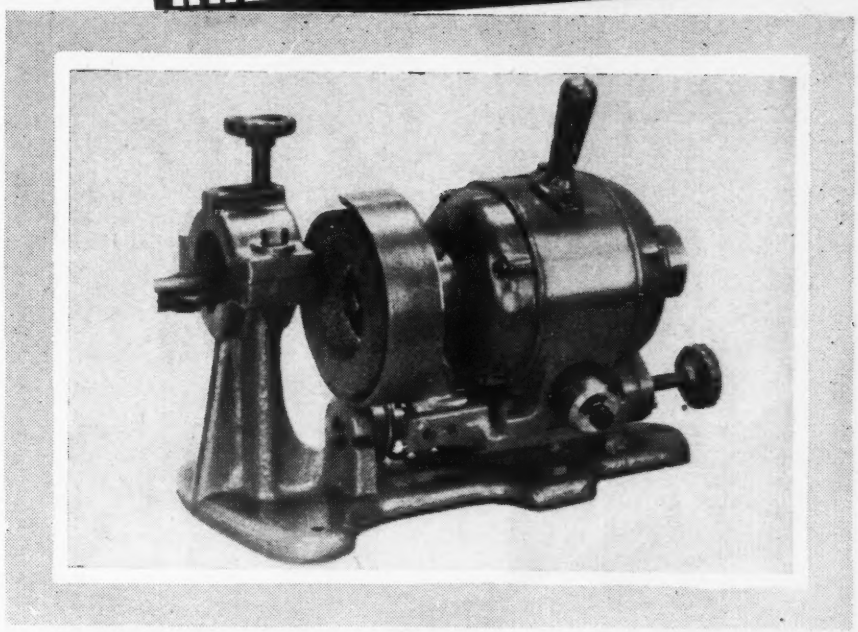

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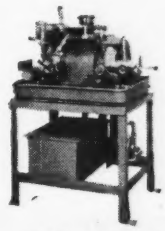

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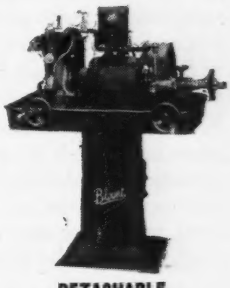

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	FREE DUST FLOW	

DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"

Colorado *(continued)*

▶ It is reported that a strike apparently similar to one of the old-time gold and silver bonanzas that made the San Juan mining region famous, has been made by Telluride Mines, Inc., the company that took over the holdings of Veta Mines, Inc. A 4-ft. orebody, recently opened up, is reported to be rich in gold and silver as well as lead and zinc. Telluride Mines, Inc., has been producing about 300 tons daily, and this new strike will add greatly to the optimism in the San Juan section. H. S. Worcester is president and manager; John Ferguson is vice president and treasurer; Clyde Nettleton, secretary. Company directors are: E. L. Elliott, of New York; E. P. Furman, of Santa Barbara, Calif.; A. S. McGregor, of Milwaukee, Wis.; Charles H. Jackson, Jr., of Santa Barbara, and A. A. Schlesinger. The company controls the Smuggler Union, Tomboy, Humboldt, and Cimarron mines, a total of several hundred acres in Ouray and San Miguel counties. The property is opened through the Bullion and Pennsylvania tunnels connected by several interior shafts. A crosscut 4,000 ft. long has been driven to develop the Tomboy-Montana mine. Ore is sent to the mill via a 3,000-ft. tram from the Pennsylvania tunnel portal.

▶ Harold M. Koster, Inc., of Chaffee County, has purchased the Complex No. 1 and 2 on Quartz Creek in Gunnison County, from Mrs. A. E. Nicholas, G. A. Norwood, and A. L. Pearson, of Pitkin.

▶ Colgate and Hoge, operating the Keystone mine, near Silver Cliff, are unwatering and retimbering it preparatory to early production. They plan to work the zinc sulphide zone, with Dick Colgate in charge of operations. This property was worked from 1880 until 1900 as a silver producer.

▶ Harrison S. Cobb and associates, operating the Ohio mine, in Bummer Gulch, Boulder County, are making shipments of scheelite to the Metals Reserve stockpile. They are also working the Cold Spring dump.

▶ Stiers Brothers Construction Co., driving the Treasury tunnel, near Ouray, report that the work is progressing well. The Black Bear vein, or its extension, has been cut after drilling over 4,500 ft. Crews are now drifting along the vein, and will continue for nearly 2,500 ft., whereupon a 1,180-ft. raise will be driven into the old workings of the Black Bear. This mine is on the western slope of the La Plata Mountains at an elevation of 12,400 ft., in the area which also contains the famous Smuggler Union and Tomboy mines. The portal of the Treasury tunnel on the eastern slope of the mountain is at an elevation of 10,625 ft. The work was undertaken to permit mining the Black Bear ore without the hazards of snowslides encountered during the winter at the high elevation on the western slope. Further, in addition to extracting the known ore reserves in the Black Bear mine, the adjacent territory can be mined. There is considerable water in this section, due to the heavy snowfall each year, and the ground does not drain excepting through

tunnels of this nature and other workings. The operation is being carried on by the Sunshine Mining Co., as agent for Metals Reserve Co., with John Edgar as chief engineer.

▶ Ores from the Kitty Clyde mine, in Spring Gulch; the Dexter group, in Gilson Gulch; the Harrison Croesus, in the Freeland district, and the Widow Woman, in the Virginia Canon district, have kept the Clear Creek Gilpin, Humboldt, and other mills in the Georgetown-Idaho Springs district operating this winter.

▶ W. B. Roberts, Spencer ranchman, has been developing a lime deposit just above the big spring on Nine-Mile Hill, Gunnison; and he is now selling calcium carbonate to flour and feed mills as far west as Delta and to ranchmen throughout this part of western Colorado. The deposit was discovered while setting telephone poles, and assays 99.78 percent calcium carbonate, the highest yet recorded in Colorado.

▶ Joseph M. Bradley, general manager of the Highland Mary mine, near Silverton, has been supervising repair work and has added several cars to the mine equipment, in preparation for operations at the mine in Cunningham Gulch this spring. He has also arranged for additional storage of concentrates.

▶ Monarch Galena Co., near Cotopaxi, in Fremont County, has 18 men working and is making regular shipments, averaging 10 carloads of zinc ore per month, from this property, T. H. Sackett is general superintendent. The zinc ore is being shipped to the Golden Cycle mill, at Colorado Springs.

▶ Robert Sterling, western mine manager for Vanadium Corp. of America, has about 20 men operating the Conger mine and mill, near Nederland. They are producing high-grade tungsten concentrates and are working one shift per day.

▶ Lark Mining Co. has purchased a large tractor to keep the mine open during the heavy snow season. The property is near Silverton.

▶ Parks Van Dolah and William Waters, who have been in charge of the Monte Cristo property, have closed down the mine until spring and returned to Cripple Creek. The mine, which is a surface operation, has been shipping zinc-lead ore to the company mill at Colorado Springs.

UTAH

Non-ferrous Metals Commission orders raise for night shifts—Union declares it inadequate

▶ Members of the International Mine, Mill and Smelter Workers (CIO) voted on Jan. 18 at Salt Lake City to appeal to the War Labor Board the Non-ferrous Metal Commission's order to increase mine and smelter workers' wages 25c. per shift for late afternoon and night shift work. Reaffirming their "no-strike" pledge, union officials declared the 25c. night shift dif-

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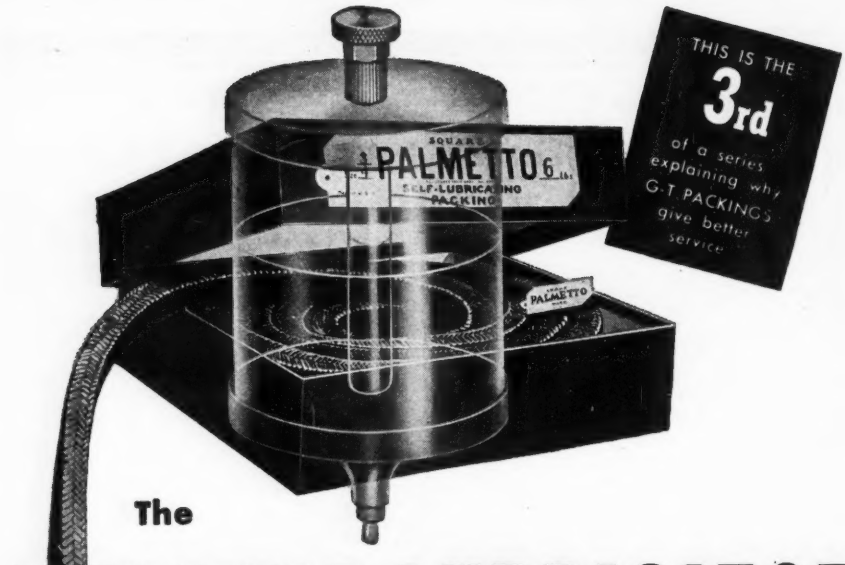

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Utah *(continued)*

ferential wholly inadequate to meet the increased cost of living. Increases ranging from $1.30 per shift for common labor to $2.30 for miners had been requested in the cases heard in Salt Lake City by the Non-ferrous Metals Commission last fall. Charles A. Graham, Commission chairman in Denver, said the increase would compensate workers for the extra expense and abnormal living conditions of those working late afternoon and night shifts. Mine operators discussed the commission's decision but announced no plan of action. At the hearings, operators had maintained that no advance in wages could be allowed under the wage stabilization program. The 25c. increase, retroactive in most cases to the expiration date of the last contract (July 1, 1943), is also dependent on two conditions: that OPA find the increase will not necessitate a price ceiling change with respect to companies without government contracts; and that military procurement agencies find the change will not substantially increase costs of those companies holding contracts.

▶ A number of other requests affecting employment in Utah, Nevada, Idaho, and Colorado were acted upon by the Commission. Other major cases pending include Phelps Dodge operations in Arizona and those of the Anaconda Copper Mining Co. in Montana. The union made requests involving sick leave, vacations, physical examinations, and other issues, most of which were denied.

MONTANA

Domestic Manganese mill now operating—Jardine mill revamped to treat arsenic-tungsten ore

▶ Domestic Manganese & Development Co., of Butte, put its new 400-ton manganese ore concentrator into operation on Jan. 2 and its nodulizing plant on Jan. 7. Construction of the concentrator and remodeling of the nodulizing plant are reported to have cost $500,000. The new mill is designed to concentrate manganese carbonate ore by flotation. The flotation concentrate goes to the nodulizing plant, where the manganese carbonate is converted by roasting to manganese dioxide. Construction was commenced on June 1 and completed on Dec. 24, 1943. Funds were supplied by Defense Plant Corp. The plant was designed by George W. Griswold, Jr., of Butte, who also supervised the construction. The mill will treat manganese ore from the Metals Reserve stockpiles in the Butte and Philipsburg districts, as well as current production from such mines as the Minnie Jane, Norwich, Great Republic, and Tzarena, in the Butte district, and the Moorlight, Trout, and Contact mines, in the Philipsburg district. John H. Cole, Butte, is president and manager of Domestic Manganese & Development Co.

▶ The Boaz mine, near Norris, in Madison County, has closed its 35-ton concentration

and cyanidation mill because of the current labor shortage. The mill has been cleaned up and put in condition to be reopened when conditions permit. Production from the mine is continuing on a high-grading basis. The lead-gold ore is mined selectively, sorted into three grades, and shipped to the smelter of American Smelting & Refining Co. at East Helena. When the mill was in operation it produced a galena and pyrite concentrate, which was also shipped to East Helena. The winze from the 500-ft. level of the Boaz mine has been completed to the 700-ft. level, the vein is being drifted out, and stoping is in progress above the level. Current production is principally from the 600- and 700-ft. levels. K. D. Lynn is manager of the Boaz mine and John Hughes is mine foreman.

▶ Jardine Mining Co. is developing arsenic, tungsten, and gold ore in a hitherto unexplored area of the mine at Jardine, in Park County, and the mill is being revamped to produce arsenic trioxide, tungsten, and gold. Current development in the mine and the remodeling of the surface plant are being financed by a loan from the Smaller War Plants Corp. Prospecting east of the Bear Gulch fault in recent years revealed that the veins which were mined since the 'eighties in the old part of the mine are apparently continuous beyond the fault. The ore in the veins at Jardine contains arsenopyrite, scheelite, and gold. The 10, 11 and 12 levels are being driven in this ore east of the fault and raises in the vein are being put through connecting the levels. According to report, the old Jardine mill has been rebuilt and new equipment has been substituted for outdated machinery. The old battery of stamps has been replaced by modern jaw and gyratory crushers. An arsenopyrite concentrate will be produced by flotation. A new calcining plant that includes the latest equipment for the production of white arsenic from arsenopyrite concentrates has been built. Gold in the arsenic ore will be recovered in a cyanidation unit now under construction. The surface plant is designed to treat 300 tons of ore daily. William H. Hax is president and manager of Jardine Mining Co. Ray Gilbert is geologist, Gunnar Johnson is mine foreman, and Al Almquist is mill superintendent.

IDAHO

Agreement reached on mining new Chester vein strike—Luck still good at Lucky Friday

▶ Dividends from the mines of the Coeur d'Alene district for 1943 total $4,547,029, compared with $5,147,480 for 1942, showing a decrease of $600,451. This is the lowest dividend record for the district since the depression year of 1938, when the mine dividends totaled only $3,970,498. The dividend shortage in the current year is due entirely to an acute shortage of labor, many of the big mines being reduced to half-capacity production for several months during the year and at no time reaching full-capacity output. Two divi-

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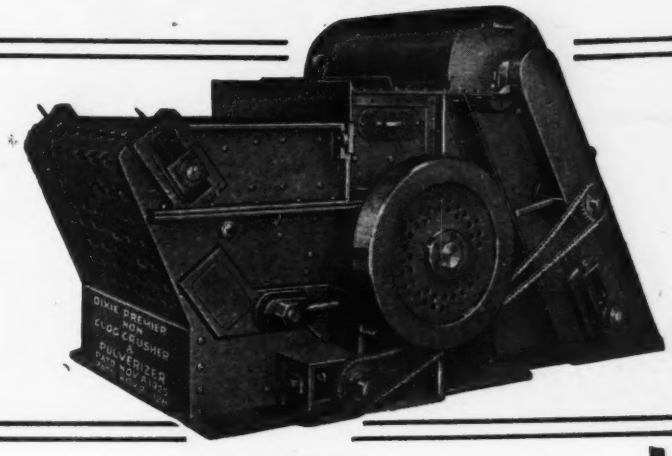

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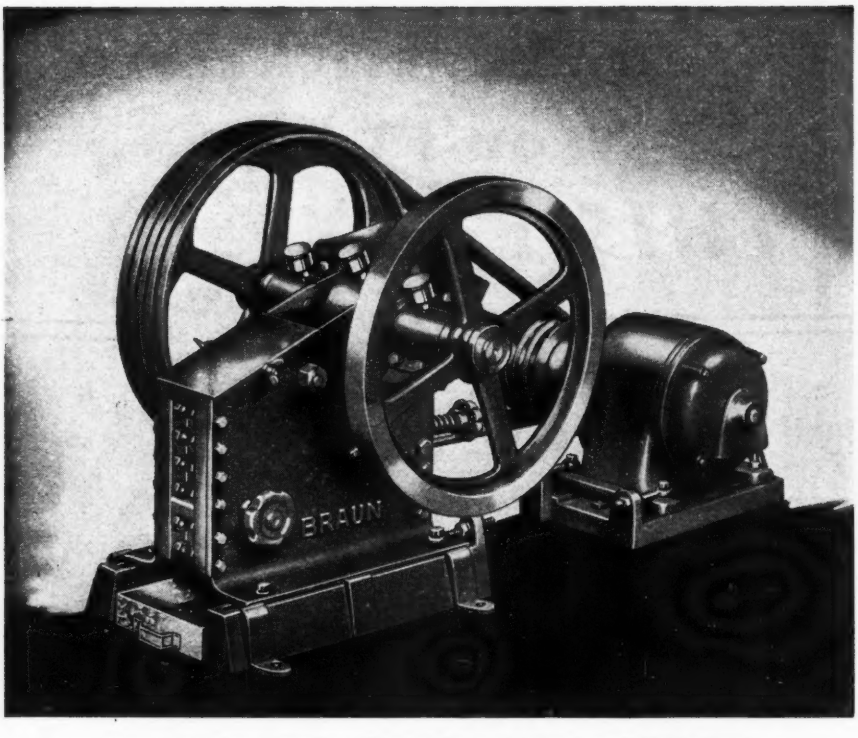

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Idaho *(continued)*

dend-paying mines, Polaris and Coeur d'Alene Mines, were forced to suspend payments because of priority labor allocation. Both mines were designated by the War Labor Board as silver mines and placed in Class 3. The big Sunshine mine was also placed in the third class but was able to continue dividends at a reduced rate. The dividend record for the mines of the Coeur d'Alene district in 1943 is as follows:

Bunker Hill & Sullivan	$1,308,000
Caledonia Mining	71,627
Clayton Silver	90,000
Dayrock Mining	34,943
Federal Mining & Smelting	863,240
Hecla Mining	1,000,000
Sherman Lead	110,250
Sunshine Mining	668,969
Tamarack & Custer	400,000
Total for 1943	$4,547,029

▶ Production of ore from the rich discoveries recently made in what is known as the Chester vein system will be entirely under the management of the Sunshine Mining Co., because the deep workings of this company offer the only economical approach to the area. The operation involves three other mining companies—Polaris, Silver Syndicate, and Silver Dollar—each of which has made an agreement with Sunshine. Polaris will pay 50 percent of its net profits to Sunshine for ores mined from the Chester vein; Silver Syndicate, 60 percent, and Silver Dollar, one-third. Chester vein ore, encountered at a depth of 2,700 ft., was one of the big surprises of the Coeur d'Alene district. It had been prospected by Polaris down to the 1,900 level without finding ore of commercial importance, but because the vein always showed a strong and wide shear fissure, the company management decided to take a last look at it on the 2,700 level, where a drift had been driven in from Sunshine workings on the Polaris vein. This crosscut opened about 10 in. of high-grade ore in the Chester vein. The company started drifting east on this ore and soon had a full face of high grade, which opened to 18 ft. in width with average assays of 80 oz. in silver in addition to high lead content. The muck from the development drift was shipped direct to the Bunker Hill smelter without sorting or mill treatment and gave net returns of 25 percent lead and 50 oz. in silver. Other openings made in adjoining properties have proved continuity of the orebody, both in quality and quantity.

▶ Lucky Friday Mining Co., operating a prospect development near Mullan, has produced $127,205.74 worth of silver, lead, and zinc ore in sinking a 600-ft. shaft. Latest returns are from the Bunker Hill smelter and Sullivan zinc plant for 27 tons of lead concentrate and 17 tons of zinc concentrate, which produced a combined net profit of $8,597.18. The Lucky Friday has paid its own development expense from the start of operations and in addition has paid its own purchase price of $15,000. The company has just completed a new shaft extension of 200 ft., bringing the development to the 800-ft. level. All the ore mined has been taken from one short shoot near the shaft. Other known oreshoots will be opened from the 800 level. The property is midway between the

Osburn and White Ledge faults, in a part of the Coeur d'Alene district in which no other producing mines have been found. The property presents a geological study in that the ore is in the Revett formation at the surface, although other mines of the district do not encounter Revett except in their deepest workings. The Lucky Friday Co. is a stock company owned by a few local people.

▶ Hecla Mining Co. has purchased a group of 13 mining claims containing a body of zinc ore from the Boundary Basin Mines Co. in British Columbia, 16 miles northwest of Metaline Falls, Wash. The consideration paid was $40,000 cash and 6 percent of future net smelter returns. The orebody so far as explored is about 7 ft. wide and is oxidized, according to L. E. Hanley, president and general manager of Hecla, who said that the first move of Hecla will be to diamond-drill the vein system to determine the depth of the oxidation and the extent and value of the sulphide ores before any attempt at production will be made. Hecla's interest in zinc is because of its half ownership with Bunker Hill in the $3,000,000 Sullivan zinc plant at Kellogg. This plant employs 350 men, uses 25,000 hp. of electricity, and produces 3,500 tons of 99.99+ pure slab zinc and 36,000 lb. of cadmium per month.

▶ Hecla Mining Co. has closed the Silver Cable mine, east of Mullan, for the winter because of snow conditions at the mine and difficulty in keeping roads open for ore transportation. The company has been producing 80 tons of zinc-lead ore per day since early last spring, and which has been hauled by truck to the Hecla mill, at Gem, a distance of 17 miles. Hecla is operating the property under lease from the Silver Cable Mining Co. In stoping the company has developed an oreshoot 8 ft. wide and 800 ft. long, all above the No. 3 tunnel level. No ore has been found on or below the No. 3 level, but it is understood Hecla will do some deeper work in an effort to locate it.

▶ In declaring its fourth quarterly dividend for 1943, Federal Mining & Smelting Co. reduced the rate from $1 a share to $0.50. The Christmas dividend at $0.50 totaled $123,320, bringing the total for the year to $863,240, against $986,460 for 1942, and brought the grand total paid to date to $29,377,640. In explaining the dividend cut Francis E. Brownell, president, said in his report to stockholders: "This is 50c. less than has been paid quarterly for several years past. The annual report for the year 1942 stated why it is desirable to maintain an increased cash reserve. After the payment of the present dividend, the cash reserve is estimated to be somewhat less than shown in the annual report at the end of 1942." In the 1942 report Brownell said: "As explained in the report of the general manager, operation of the Morning and Tri-State mines under existing conditions is largely dependent on the premium prices paid by the government for production in excess of quota. On that account directors deemed it desirable to maintain an increased cash surplus over the amount held at the end of 1941, as should these premium payments be discon-

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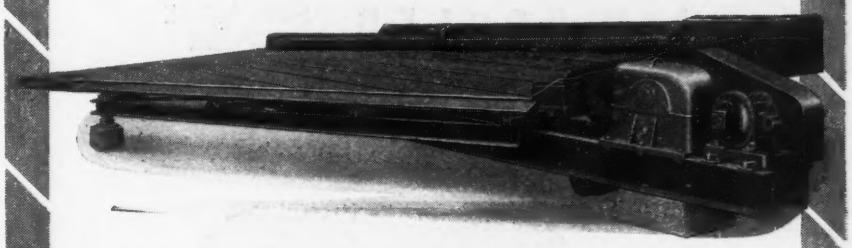

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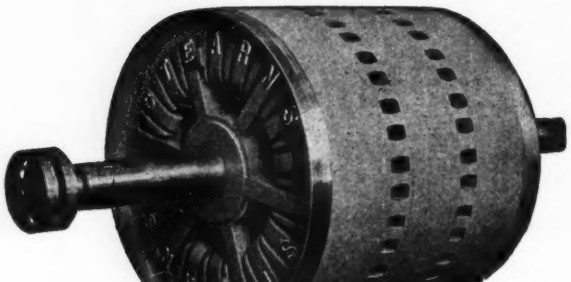

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Idaho *(continued)*

tinued, or other unfavorable conditions develop, the company might be faced with the problem of a lean period."

▶ Federal company reports the discovery of a new body of high-grade zinc-lead ore in the Tony vein of the Page mine, west of Kellogg. Discovery was made at a depth of 2,300 ft. The ore-body is 8 ft. wide and assays an average of 34 percent in combined zinc and lead values, zinc predominating. It has been opened by drift for over 200 ft. in length.

WASHINGTON

Holden mine zinc output important to State — Iron-nickel smelter planned in Blewett Pass area

▶ Governors of the Pacific Northwest states, at a recent meeting in Spokane, called attention to encroachment on state rights by the federal government, and subsequently Northwest Mining Association passed a resolution asking Congress to stop the activities of federal bureaus and agencies, which the Association says are taking over for the federal government millions of acres of mineral, timber, water, and other natural resources on the Pacific Coast. The resolution further urged Congress to enact measures for the restoration of such resources as have already been withdrawn and which are not being used.

▶ The U. S. Bureau of Mines, in its annual production record for Washington, says that an important feature of metal output in 1943 was the zinc production of Howe Sound Co., from its copper orebody at the Holden mine. Washington mines, in 1943, yielded gold, silver, copper, lead, and zinc to the amount of $7,989,720, compared with $8,172,609 in 1942, a 2 percent decrease. Power failure and labor shortage in the Metaline district caused a sharp curtailment of zinc and lead production in the spring of 1943. Labor shortage continued throughout the year, but additional men are expected in the Metaline district as government-financed housing facilities are increased. Lead production showed an increase in the year, and the other metals a decrease.

▶ Kaaba-Texas mine, 13 miles west of Oroville, was in operation continuously in 1943, according to Lee B. Carroll, manager. Concentrate shipments ran 72.3 percent lead, 4.5 percent copper, and 135 oz. of silver to the ton. Zinc shipments, he says, approximated 50 percent zinc. Some of the ore came from a large vein previously believed to be too low grade for profit. Mr. Carroll says that Truman Higginbotham, consulting engineer, improved mining methods so that production amounted to 13 tons per man per shift. The grade of ore has been improved by opening an extension of the original oreshoot in the discovery. Drifting on the new ore is in progress.

▶ Baily Furnace Corp., of Ohio, contem-

plates erecting a smelter in the Blewett Pass area as soon as the extent of the iron-nickel deposits there is determined, according to Congressman Walt Horan.

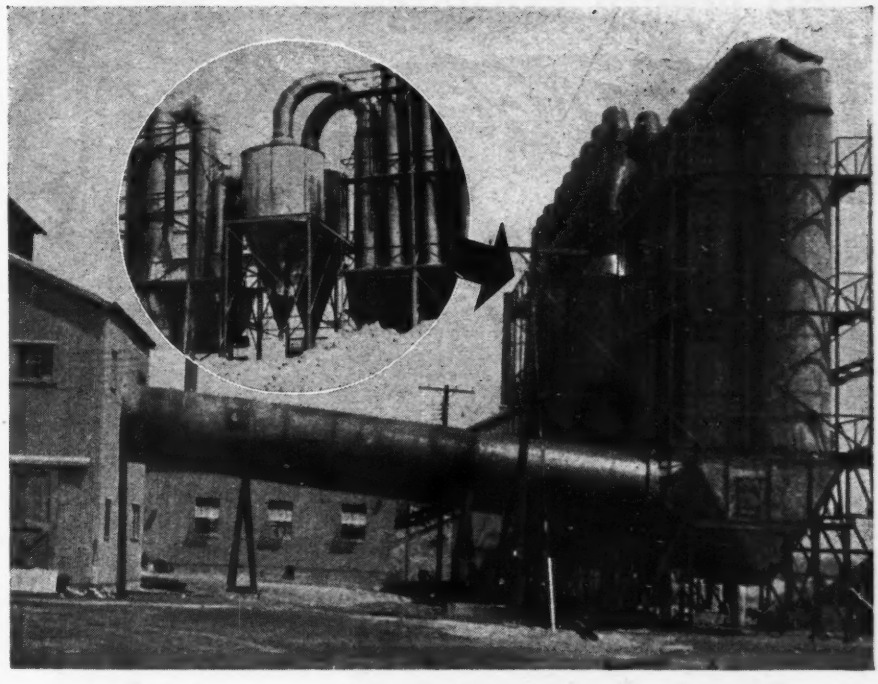
▶ Operations of the aluminum and magnesium plants near Spokane are continuing at near capacity. Aluminum Company of America reports an expected increased call for sheet aluminum for aircraft production. E. G. Schoeffel, manager of the Mead plant, is leaving for Pittsburgh to become assistant manager of reduction plants at that point. He is being succeeded by W. M. Farquahar, of the Riverbank plant at Modesto, Calif.

TRI-STATE

U.S.B.M. reports 1943 Tri-State premium payments—Eagle-Picher abandons Wentworth area

▶ Of particular interest to the Tri-State mining industry during January was the estimate of approximately $15,000,000 for zinc and $2,200,000 for lead during 1943 in premium payments on district concentrates, which was made by the Joplin office of the U. S. Bureau of Mines. The market value of the concentrates at quoted prices was reported at $20,800,000 for zinc and $3,400,000 for lead, bringing total values to $35,800,000 for blende and $5,600,000 for galena. This compared with total values of $30,905,327 and $4,456,782, respectively, in 1942. The combined total value of the concentrates last year, amounting to $41,400,000, was the highest since 1926 and compared with a peak of $57,321,173 in 1925. The district continued to be much the largest domestic zinc-producing area, although its portion of U. S. production declined from 31 percent in 1942 to 27 percent in 1943. Production of zinc concentrates amounted to about 377,523 tons, against 443,847 tons in 1942 and 478,403 tons in 1941. Lead concentrates produced amounted to about 47,147 tons, compared with 44,857 and 53,690 tons for the two preceding years. It was stated that decrease in zinc output over the last two years was due primarily to depletion of reserves of high and medium-grade ores, and part of last year's decrease was attributable to setbacks in operating schedules caused by labor shortage, the destruction of two large mills by fire, and the flooding of many mines in May of 1943.

▶ Eagle-Picher Mining & Smelting Co. has abandoned mining and milling operations in the Wentworth area, G. C. Niday, of Miami, Tri-State manager of operations, has announced. Three mines operated by the company in the area prior to the closing of the properties were those on the Decker, Owen, and Stephens land. Pumps at the mines have been pulled and a clean-up has been made at the Navy Bean mill, three miles west of Wentworth. Approximately 60 men were employed by the company at the Wentworth properties, and these have been transferred to other Eagle-Picher operations in the Tri-State, including those at Galena, Niday said.



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GENERAL ELECTRIC

Tri-State *(continued)*

▶ Preparations are being made by St. Louis Smelting & Refining Co. to move a large steel derrick and 500-ton hopper from the south shaft, on the Robob lease southwest of Baxter Springs, to the Hartley lease adjoining the Ballard mill on the north, according to a report by Howard H. Utley, of Baxter Springs, Tri-State agent for the company. A new derrick and 350-ton hopper of wood construction is being built alongside the steel units at the Robob mine, which was subleased some time ago to, and is being operated by, Earl Childress, of Baxter Springs, and will replace the steel units as soon as they are moved off the Robob mine shaft. Ore from the Robob mine will continue to move by rail to the Eagle-Picher Central mill for treatment. The St. Louis company has dewatered the old Hartley lease, which now is connected underground with the Ballard mines. Ore from the Hartley lease is being moved underground by electric trolley to the Ballard mill shaft for hoisting. An unloading ramp is being completed at the foot of the old incline tramway south of the Ballard mill shaft. The unloading ramp comprises two 50-ton hoppers, and will receive ore from trucks that will haul it from the Hartley derrick-hopper when it is installed. Underground haulage will be continued as well as the truck haul. The company also plans to reopen the north shaft on the Hartley lease later, after it has been repaired, Utley said.

▶ Bilharz Mining Co. is sinking a new shaft on the northwest 40-acre tract of the Brewster land, a mile northwest of Baxter Springs, according to O. W. Bilharz, company manager. The new shaft will be designated as the No. 8, and will tap some of the lower ground west of the Bilharz-Brewster mill. When the shaft is completed the mine will be opened up around the 200-ft. level, according to Bilharz.

▶ Operations are being expanded by the Mark Twain Mining Co. on the old Blue Mound and Blue Diamond leases, north of Picher, in Kansas, and bordering the state line. The company has completed the building of a 700-ton hopper and is erecting a derrick in conjunction over an old shaft about 100 ft. south of the old Blue Mound mill shaft. The structures are of wood and the building contractor is Rodney Dorman, of Galena. A new compressor room, housing an 888-cu.ft. compressor powered by a 150-hp. electric motor, has been built, and a blacksmith shop building is under construction. A transformer unit has been installed near the mine, and electric power will be used for hoisting also. Laying of a railroad spur from the N. E. O. lines near by to the large hopper is being completed. With the start of mining at the shaft, ore will be shipped by rail to the Eagle-Picher Central mill for treatment. Mine operations on the two leases will be carried on from the 240 and 290-ft. levels, and to an upper level later. Associated in the company are W. L., Harold, Howard and Fred Childress, and Lincoln Smith.

▶ MacArthur Mining Co. recently completed the construction of a new derrick

and 350-ton hopper over the south, or No. 2, shaft on the Embry land, four miles west of Baxter Springs and south of U. S. Highway 166. The company is carrying on mine operations around the 400-ft. level at the Nos. 1 and 2 shafts on the lease. Ore is being trucked to the No. 3 mill of the Beck Mining Co., southwest of Baxter Springs.

ARKANSAS

Only one mill working in zinc field—New concentrators begin operating in manganese district

▶ Winter operations in the North Arkansas zinc and lead field have been light and production is low. Only two plants were active during December and January. Exploratory drilling conducted by the Bureau of Mines has been delayed by shortage of drillers. The Bureau is drilling the Speer property in Newton County, where it has encountered some good ore. When this job is completed, it will move to the Coon Hollow property near Zinc.

▶ Moark Mining Co., of Zinc, at which operations are in charge of C. T. Rabineau, has the only mill now running in the field. A car of high-grade silicate of zinc concentrate is ready for shipment. The company operates the Almy, Red Mill, Jack Pot, and Gloria. Early in December a rich face of ore was exposed in the Gloria tunnel about 20 ft. wide and 35 ft. high, containing both free silicate of zinc ore and mill ore.

▶ Hall Mountain Mining Co., J. C. Jones, of Yellville, in charge, made a good strike of rich crystallized carbonate of zinc when a crosscut struck a fault about 170 ft. from the mouth of the tunnel. A carload of free ore is in the bins ready for shipment, and a good tonnage of mill ore is on the dump. A new tunnel will soon be started on the old Wickersham dig, which lies about 250 ft. below, and 1,000 ft. to the right of the Truex.

▶ Production in the Batesville-Cushman manganese field ran approximately 762 tons in December. Zero weather and a heavy snow hit the field the first week in January, and bogged down operations for about a week. Three factors promise a much larger production for 1944 than in 1943. The demand for low grade has been increasing for the last three months. Some furnaces are now buying ore that runs as low as 25 percent metallic content. Four large washing and concentrating plants have been completed and will process a large tonnage of ore found in the residual clay from the Fernvale limestone. This will increase the production of high grade. Two beneficiating plants that will treat low-grade ore and produce a high-grade concentrate will be in operation soon. One of these plants in Batesville has been completed by the Par Mar Engineering Co. It will treat both low-grade oxides and low-grade carbonates. There are large deposits of both in the field, and if the plants work out successfully, the field has good pros-

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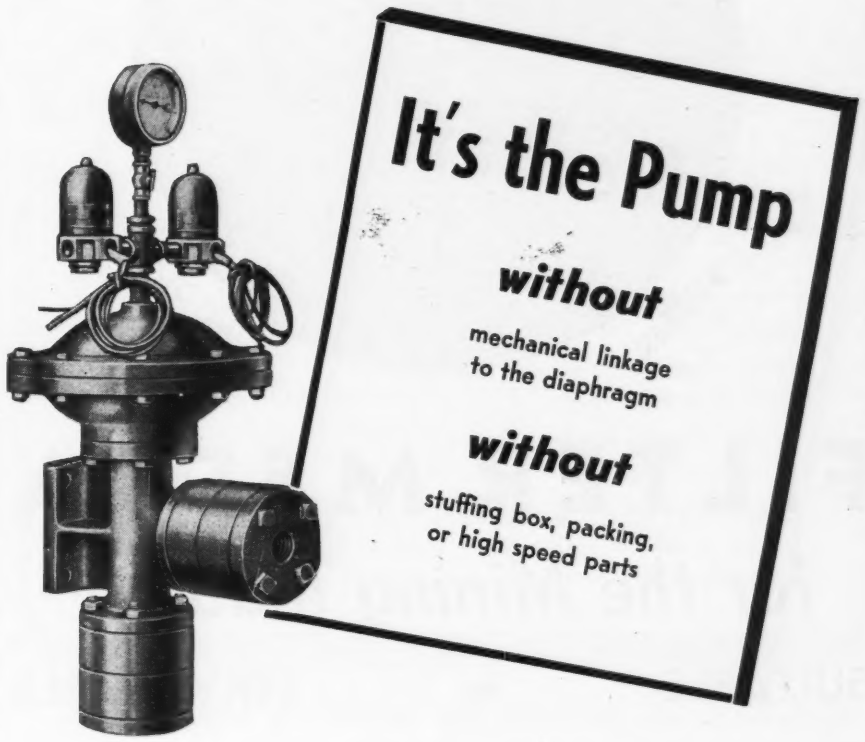

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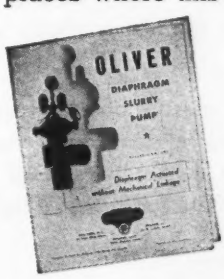

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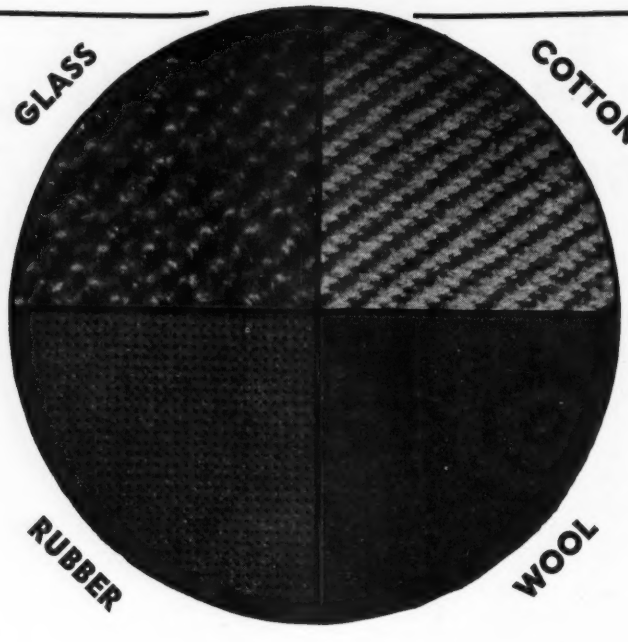

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Arkansas *(continued)*

pects. Before the war, the Bureau of Mines proved up 2,000,000 tons of low-grade wad in one area approximately five miles square. The deposits cover a much larger area than this. Metals Reserve started to purchase this grade ore when it came into the field in 1942. Thousands of tons are now in its stockpiles at Cushman and Pfeiffer, overgrown with weeds. These piles are readily available to concentrators that can handle the ore.

▶ Hendricks Mining & Milling Co., Alvin Hendricks, manager, George Weigart, engineer, and Joe Jeffcoat, well-known Tri-State mill man, as construction superintendent, all of Batesville, had a new washing and concentrating plant completed and in operation the middle of January. The plant is one of the largest and most modern in North Arkansas. Plant equipment consists of a diesel engine and electric generator which supplies power to all divisions of the plant, two 30-ft. log washers, a sizing screen, jigs, concentrating tables, sludge vats, puddling vats, and other minor appliances.

▶ Par Mar Engineering Co., of Batesville, James Wood, engineer, and Max Cohen, work manager, has a concentrator in operation. When the *E. & M. J.* correspondent visited the plant early in January, preparations for the first trial run were under way. Before the plant was constructed, laboratory tests were made on the method, and they proved successful. Later, a small pilot plant also achieved successful results. After these experiments, the big plant, which will handle approximately 200 tons a day, was built.

▶ Walter H. Denison Manganese Co., headed by Reed Denison, of Cushman, made the largest production in the field in December. It ran around 300 tons and was produced at the company's mines in the Pfeiffer district. The company is also installing a large washing and concentrating plant on the Adler property, which will be in operation soon.

▶ Arkansas Manganese Co., headed by Jack Gibbons, of Cushman, was the second largest producer in December with 138 tons of high grade and 114 tons of low grade. The company operates the Aydelotte property, near Cushman, and practically all its mining is done from shafts and drifts.

▶ Charles Sims, of Cushman, now operating the Einstein and Waters properties, produced 50 tons of low-grade and wash ore in December.

▶ Preston Grace and Marshall McGee, both of Batesville, who operate the Bill Chin property, in the Cave Creek area, produced 150 tons of medium hard ore in December. Their long tunnel, which now runs about 400 ft. back into the mountain, still carries a good face. They are also producing from a shaft and drift mine. They have a big deposit of carbonate on their property, and recent furnace tests made on the ore indicate that they may be able to start carbonate production soon. They are also constructing a beneficiating plant at Pfeiffer, on which to treat low-grade oxides.

▶ Stanley Bourne and Ernest Stroud, both of Batesville, operating on the Austin property, near Mt. Pleasant in Izard County, started work the first week in January after a shutdown during the holidays. In the last six months they have proved up one of the largest deposits of pyrolusite ever found in the field. They are now sinking two new shafts and have struck ore in one of them at a depth of about 15 ft. They contemplate opening up a pit mine on the property. This method in handling this class of ore would be much easier than the shaft-and-drift method. Their deepest shaft is down 84 ft. and is still in ore.

MICHIGAN

Centennial shaft nearly ready for mining—C. & H. and union reach settlement of employee bonus problem

▶ Total number of men working in the mines of Houghton County during the past year was 3,350, of which 1,414 were employed underground and 1,936 on surface. Most of the men employed by Calumet & Hecla Consolidated are in Keweenaw County mines. The number in Houghton County on the payrolls of this company totaled 130 underground and 1,150 in the mills and on surface. Copper Range employed 672 underground and 417 in surface plants; Isle Royale, 271 underground and 151 surface; Quincy, 335 underground and 218 surface. Six were employed in the Arcadian tunnel. In Keweenaw County, total number of men employed underground and on surface, all of them by Calumet & Hecla, was 828, of which 615 were underground forces and 213 in surface plants. The majority were employed in the Ahmeek mines. There were nine fatal accidents in the Houghton County mines during the year and one such accident occurred in Keweenaw.

▶ Dewatering of the Centennial shaft, in which mining will soon be resumed by Calumet & Hecla, is progressing steadily. The level of the water has been reduced to below the 38th level. A new dry building has been completed, affording modern facilities for the men. Engine house repairs have been completed and two new electric compressors installed.

▶ At Calumet & Hecla's new Allouez shaft, near Ahmeek village, drifting is under way in the conglomerate bed and crosscutting is being done to examine some of the amygdaloid lodes. The railroad into the mine has been completed. Surface installations are well under way.

▶ At the new Iroquois shaft of Calumet & Hecla, mining and exploratory work is proceeding in drifts from the 1,700-ft. level. Surface plant equipment has been improved and a new water line constructed from Seneca Lake to a large reservoir at the mine. The railroad line now connects Iroquois with the main line at Ahmeek, providing direct shipping by rail of copper rock from the mine to the mill.

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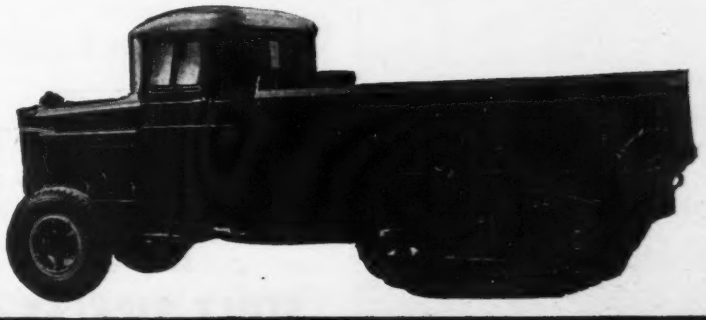

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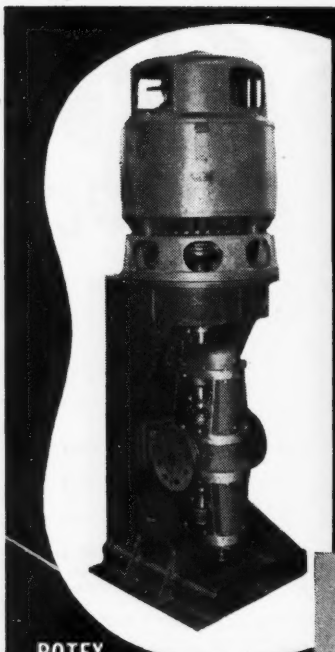

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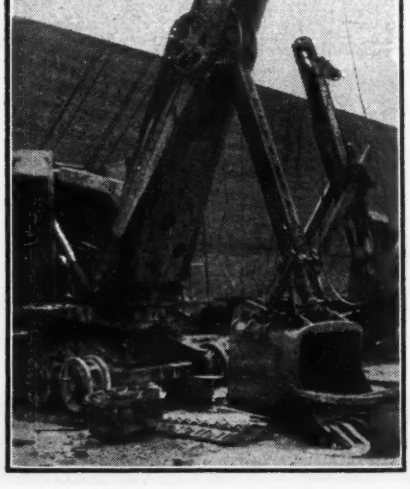

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Michigan *(continued)*

▶ The dividend bonus has been restored to all employees in Calument & Hecla's Calument division subject to the jurisdiction of the War Labor Board. It is retroactive to September and the bonus for December and September, for those who share in both, is $20. There are 2,255 employees of the Calumet division who will participate in the bonus; also 1,100 of the Wolverine Tube division in Detroit. Restoration of the bonus in the Calumet division was made through agreement with Local 584 of the Mine, Mill & Smelter Workers. The company and the Independent union have applied to the War Labor Board for restoration of the bonus to all employees represented by it. The company also has applied for restoration of the bonus to other non-supervisory employees represented by neither union. Through agreement by the Treasury Department and the War Labor Board, the company extended the bonus plan to employees of its Wolverine Tube division.

IRON COUNTRY

Ore consumption reached peak in 1943—Davidson Iron Co. has new shaft at Iron River, Mich.

▶ The consumption of Lake Superior iron ore for the first 11 months of 1943 amounted to 81,518,593 gross tons, against 78,466,094 tons for the comparable period in 1942, according to the Lake Superior Iron Ore Association. Estimating the December consumption at that for October, it appears that the total for the full year will be about 89,270,000 tons, new all-time peak, comparable only to 86,225,460 tons in 1942. Ore consumption appears to have reached the peak of the war effort with the 1943 record. This theory is based on current news of the iron and steel industry. Stocks of iron ore on Lower Lake docks and in furnace yards totaled 49,371,030 tons as of Dec. 1, against 48,614,006 on Nov. 1, and 53,703,458 tons Dec. 1, 1942. A liberal estimate of the ore carry-over as of May 1 next is 16,000,000 tons.

▶ Bids were received on 21 State-owned mining units by the Executive Council and Commissioner of Conservation of Minnesota at St. Paul. It will be noted that the demand for permits to explore the low-grade iron-bearing taconite properties is keen and is suggestive of future important developments in the changing phases of iron mining.

▶ This winter Butler Brothers, Cooley, Minn., will be active with power shovels engaged at pit expansion of the Galbraith iron mine and the Weggum iron mine, on the Mesabi iron range. The Weggum iron mine, at Hibbing, is the former Philbin mine. In the Nashwauk district of the Mesabi Range, Butler Brothers plan to install in the Patrick mine washing plant a double classification unit for the treatment of fines as well as a stockpiling arrangement for crude ore.

▶ About three miles south of Ishpeming, Mich., the Inter-State Iron Co., a subsidiary of Jones & Laughlin Co., has two contract diamond drills operating on the frozen surface of Iron Mountain Lake (also known as Ogden Lake), testing for iron formation.

▶ Due to ore exhaustion at its No. 2 shaft, the Davidson Iron Mining Division of the Pittsburgh Coke & Iron Co. has completed a new mine installation at its No. 1 shaft, about a half mile north of No. 2 shaft, that is one of the show places at Iron River, Mich. The new steel shafthouse was built by the Worden Allen Co., of Milwaukee, Wis., and is designed to dump ore either directly into top tram cars or into storage bins for railroad cars. An endless wire rope top tram system, driven through a rubber-lined sheave and motor, stocks ore during the winter. A new engine house of red brick and glass-block window construction houses the two hoists, main power distribution panels, motor generator set for underground haulage, and air compressor. These machines were transferred from the old shaft but are of ample capacity for the 700-ft. shaft and the 3½-ton skips now operating. A new changehouse of the latest design for air conditioning was built in combination with the heating plant. The new brick shop building is almost completed but will not be in use until next spring. The Davidson Iron Mining Co. has been operating in this location for 33 years with an average production of 350,000 tons per year. Last season over 40,000 tons were shipped, all rail, to Granite City, Ill. Rudolph Ericson is superintendent.

▶ About 100 men are now employed repairing the ore-loading docks, built of timber, of the Chicago & Northwestern Railway at Ashland, Wis. These docks handled a total of 5,449,342 gross tons of ore from the Gogebic Range during 1943 shipping season, as all ore from this range must come over these docks unless it is shipped by the longer haul to Escanaba, Mich., docks or sent all rail.

▶ The 5½-ft. diameter borehole being put down at the Cary mine of Pickands, Mather & Co. near Hurley, Wis., reached a depth of 2,000 ft. on Jan. 11. Using chilled shot under a rotating steel shoe as the grinding medium, the shaft is approaching its planned depth of 2,585 ft. at a rate of 200 ft. a month. When it is completed, the borehole will be widened out to a size suitable for a hoisting shaft. Rock taken out in this process will go down the shaft and will be trammed over to the present Cary shaft to be hoisted.

▶ Earl E. Hunner, of Duluth, general manager of the M. A. Hanna Co., announced recently that Defense Plant Corp. has authorized the Ozark Ore Co., a Hanna subsidiary, to rehabilitate the iron mine and mill at Iron Mountain, Mo. The work will be directed by George M. Cannon, of Iron River, Mich., M. A. Hanna, assistant general manager, and will be supervised at the property by W. E. Dewald. Opened by both pit and shaft, the mine has been idle 13 years, and is now full of water. The 3,500,000 tons of shipping-grade ore said to be available in the mine will be shipped to Granite City, Ill., for smelting.

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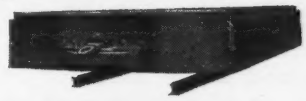

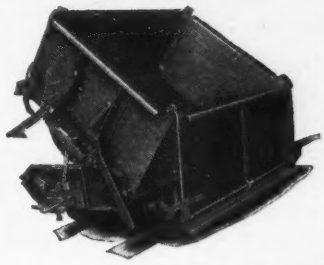

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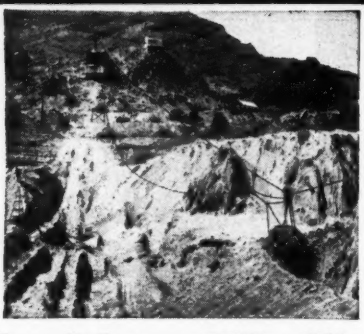

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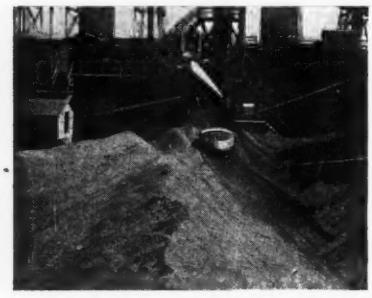

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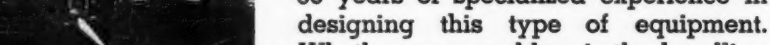

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ALASKA

New Idria Alaska mine running at half capacity—First pipeline gas reaches Fairbanks

▶ Tungsten, chromium, mercury, and antimony are among the principle mineral products of Alaska at present, L. C. Doheny, of Fairbanks, supervising engineer of the RFC, said in an address to Northwest Mining Association in Spokane on Dec. 20. He said with the suspension of gold mining, Alaska Juneau has turned to the production of strategic minerals. Doheny is making his headquarters in Spokane.

▶ New Idria Alaska Quicksilver Mining Co., in the Kuskowkim district, produced 525 flasks of quicksilver since it started operations and is now running at about half its capacity. Dan Polk, hoistman for the company, has been in Fairbanks for treatment of a broken leg, which he had set himself and which had to be rebroken and reset. Several of the other men from the mine were in Fairbanks for the Christmas season.

▶ The first gasoline via pipeline reached Fairbanks on the evening of Dec. 31. It was pumped from the storage at Whitehorse. Bechtel-Price-Callahan, contractors, had promised it would reach Fairbanks by Jan. 1.

▶ Red Mountain Chromite Inc., in the Seldovia district, is considering the advisability of tunneling from the creek bottom under the nearby 3,000-ft. mountain that is said to contain an immense deposit of chrone ore of high grade. The company built bunk houses and improved roads last season.

▶ The U. S. Geological Survey during the past summer explored molybdenite deposits on the east coast of Baker Island, in southeastern Alaska. The most extensive of the deposits is hornblende granite cut by small quartz veins. A preliminary map on a scale of 1 to 2,400, or 1 in. to 200 ft., has been prepared with contour intervals of 40 ft. Photostat copies may be obtained from the director of U.S.G.S. Holes drilled by a mining company and some older drill holes are shown on the map.

▶ C. H. Harrison, a 75-year-old prospector, who has been in Alaska for 45 years, says he knows of the existence of two ledges of tantalum in the Portland Canal district. His home is on Pennock Island.

CANADA

Mine supply and labor situation improves—New ore at Preston East Dame—Granby cuts production

▶ Facilities are soon to be provided for rehabilitating Canadian mining properties with machinery and supplies that have been unobtainable under war conditions. It is

estimated that purchases in the United States of equipment used by the gold-mining industry have dropped to the low level of about $200,000 yearly. Manufacturers within the Dominion have been producing much of the material that formerly could be secured only from sources outside the country. Gold mines have been forced by low priority ratings to resort to any equipment available, and a wide range of substitutes has therefore been adopted.

▶ L. M. Frost, Minister of Mines for Ontario, told the Ottawa branch of the Canadian Institute of Mining and Metallurgy on Jan. 19 that Dominion tax statutes should be revised with regard to mining companies to provide a 50 percent depletion allowance for both company and stockholder. As reported by the *Northern Miner*, Mr. Frost advocated a four-point program for the mining industry that included: improved cooperation among government bureaus, universities, and mining companies to aid prospectors in developing new ore deposits; succession duties to be charged in one province only; revision of security laws to protect investor, yet encourage promotion of legitimate enterprises; revision of mining tax laws to provide fairer application of them.

▶ British and Canadian authorities, it is reported, are conferring on the question of disposal of Canada's metal output in the years after the war. It is believed by many that the United States will provide little market for Canada's metals, and attempts are therefore being made to arrange for use of them throughout the Empire. Says the *Northern Miner*, "This suggests some form of cartels; these are understood by the Englishman and have not the political objections they meet in the United States."

▶ The Minister of Labor has announced that a "B" priority has been granted to certain gold mines where the labor shortage has reached a critical stage. In the Little Long Lac camp men are reported to be available for development work, the first time in a year, for the average property, that this has been the case. Winnipeg is reported to have a surplus of men adequate to supply mines in the Manitoba and Red Lake camps. The labor shortage has been relieved to a lesser extent in the Kirkland Lake and Porcupine areas, but conditions in northwestern Quebec show considerable improvement. International Nickel reports that 800 men have been added to the payroll since September, but the need for qualified miners still exists.

▶ Shipments of cobalt ore from Coleman Township and the town of Cobalt are estimated at 2,000 tons for the year ended Nov. 30. Though shipments were mainly to the O'Brien plant at Deloro for sale at the official price of $1.10 per pound for ore having a cobalt content of 10 percent, some of the output was consigned direct to purchasers in the United States at higher prices. Cobalt Products, Ltd., was the largest producer, but recovery on a smaller scale was secured from some seven other properties. The schedule of prices established by federal decree for the purchase of cobalt ore is due to expire Feb. 22 and the possibility has been considered of the price

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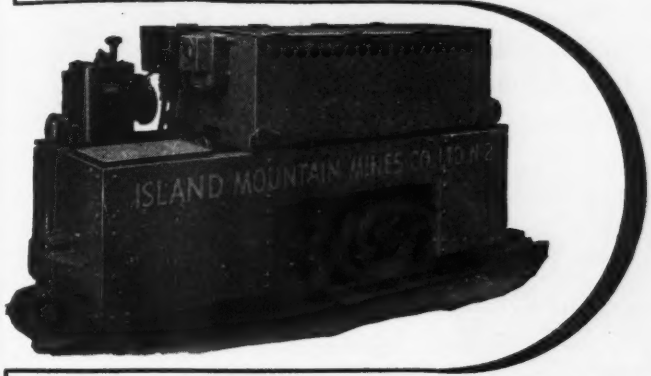

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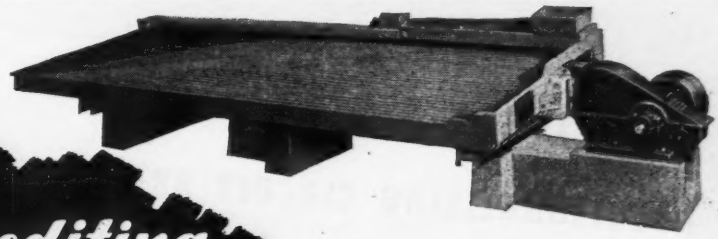

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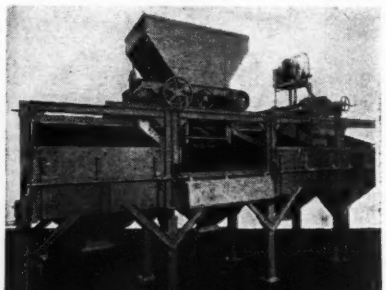

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Canada *(continued)*

reverting to its former level of $0.80 per pound. It has been suggested that purchases continue to be made by the provincial Temiskaming Testing Laboratory and that a small smelter be erected at Cobalt.

▶ Shareholders of Amic Mica Mines have voted to consolidate with two other operating companies as the Mica Company of Canada, with Norman Vincent as president. Sales made by these operators represent about 90 percent of the mica products manufactured in the Dominion. No marketing problem is expected after the war for sales of electronic mica in both Canada and the United States. Production is being secured from the Eau Claire area, near Mattawa, and from the Saguenay area, east of Quebec City. Work is in progress enlarging the processing plant at Hull, Quebec.

▶ At the annual meeting of Chromium Mining & Smelting Co. the president, Leo H. Timmins, announced that a subsidiary, the Mount Albert Mining Co., has been formed to carry on exploratory work in a favorable chromite area of Gaspé County, Quebec. The company's plant at Sault Ste. Marie, has been forced to operate at about half capacity, using chromite ore mined under the direction of Wartime Metals Corp. at Black Lake, Quebec. Restrictions have hampered the sale of ferro-alloys, and it is expected that output of high-carbon "Chrom-X" will increase after the war.

▶ December output of Preston East Dome Mines is reported by the manager, G. G. Campbell, at $254,499, compared with $166,000 for the previous month. The increase has been derived largely from ore broken in running an exploratory drift on the 12th level west of the shaft and directly west of the main Preston porphyry body. A length of 128 ft. in one oreshoot averaged $16.94 across drift width. Two flat holes drilled from the 13th level to explore the west porphyry mass gave an average cut grade of $35.80 for a 4-ft. core length and another 10-ft. section gave a cut grade of $31.95. A possible extension of the main Preston porphyry has been located in the northeast section of the property by a drill hole put down from the 12th level. Indicating a probable extension of the porphyry into this part of the property, the exploratory program is being continued in an effort to trace the downward continuation of the important new ore zone.

▶ McMarmac Red Lake Gold Mines, with reserves reduced to about six months' mill supply, is continuing exploratory drilling in an effort to test all sections of the property for new ore chances. A lens on the 150-ft. level is being drilled south of the main workings, where indications of ore have been found, and the drift is being extended to open up this promising area. Exploratory drilling has been in progress from the 300, 400, and 750 levels in an effort to discover an orebody within the formation of black sediments that has been productive on the adjoining Cochenor-Willans property. Horizons below the productive carbonate zone are also to be tested, as well as a favorable iron formation to the south.

▶ The main iron formation at Little Long Lac Gold Mines is to be explored by a long crosscut on the 2,200-ft. level as soon as the necessary miners can be hired. The area to be investigated is about 1,800 ft. north of the shaft and was explored some years ago both on surface and in three shallow drill holes. This project was one of the recommendations made by John A. Reid, consulting engineer. Preparations are being made to deepen the shaft to open two new levels below the work that is in progress at the 2,900-ft. horizon. Grade of ore has declined at depth to an average of $8.50 a ton from the gold content averaging $20.79 on the second level. Shareholders have been notified by the president, D. M. Hogarth, that ore reserves are adequate for another four years. The cost of the plant has been written off in full, with cash and securities on hand amounting to more than $1,000,000.

▶ Production at Kirkland Lake Gold Mines is being held at about 225 tons a day, with the underground crew maintained at 130 men. A recent estimate of ore available in branch veins above the 4,450-ft. level indicates that full development will not be completed for several years. Subsidiary veins on the 5,450 level have indicated better grade and tonnage than have been disclosed in any section of the mine. A maximum of five ore intersections are reported in drill cores from exploratory work to the west of any area so far opened by drifting. Hoisting has been carried on through the No. 2 winze for work on levels from 4,900 to 5,850 ft. and another winze may be put down to facilitate opening the promising area farther to the west.

▶ The level of Steep Rock Lake is now dropping at a rate of 6½ in. daily, ½ in. more than was anticipated, and the "B" orebody will be exposed by early May, it is reported. Water is pumped from the lake by 14 I-R 24-in. centrifugal pumps mounted on seven barges and driven by 500-hp. motors. (See *E. & M. J.*, Dec., 1943.) It is expected that actual production of iron ore will begin by August.

BRITISH COLUMBIA

▶ A. E. Jukes, president of Gold Belt Mining Co., Ltd., was reelected to his third term as president of the British Columbia and Yukon Chamber of Mines at the annual meeting of that body, held Jan. 11. Other officers for the ensuing year include: E. C. Carson, Minister of Mines for British Columbia; Mayor J. W. Cornett, of Vancouver; Dr. R. E. McKechnie, Chancellor, University of British Columbia; Justice Alex M. Manson; George Black, member of the House of Commons for Yukon; and treasurer: Walter B. Boucher, Royal Bank of Canada.

▶ Recent advices received from National Selective Service indicate that some relief is to be given the hard-pressed British Columbia gold mines in the matter of labor priority. The industry has been in a precarious position ever since the adoption of the order prohibiting the employment of new men in the gold mines of British Columbia and Yukon. During the past two years, two-thirds of the operating mines have been compelled to suspend

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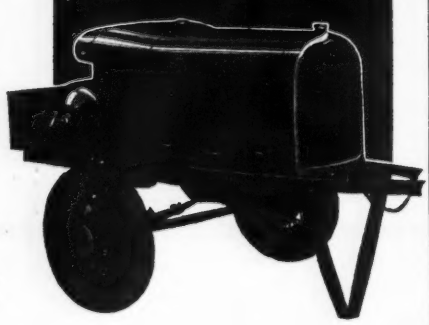

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Canada *(continued)*

operations as a result of the increasing shortage of labor. Recently, however, the Dominion Government has become converted to the belief that the gold-mining industry, if permitted to survive or to restore itself to anything approaching its former importance, will aid in post-war rehabilitation. First concessions from the local office of Selective Service include permission to Pioneer Gold Mines of B. C., Ltd., to hire 40 additional men; to Cariboo Gold Quartz Mining Co., Ltd., to hire 50; to Island Mountain Mines Co., Ltd., to hire 15; and to Sheep Creek Gold Mines, Ltd., to hire 24 more men.

► Failure of Metals Reserve Co. to renew its contract for the purchase of copper concentrate, the high cost of production, and the labor-shortage situation have compelled Granby Consolidated Mining, Smelting & Power Co., Ltd., to curtail operations at the Copper Mountain mine and the Allenby concentrator, Similkameen district. Present policy of the company is to continue its shipments of ore and concentrate even though it may have to store concentrate or copper, and to release as many men as it can to either the armed services or to other essential industries without having to suspend metal production. A. S. Baillie, vice president and general manager, states: "Sometime around the latter part of January the company will be obliged to either store its production or sell its copper at a price of 11.7c. per pound. The costs covering freight on ore, freight on concentrate, and smelting, refining, and marketing amount to roughly 5.7c. per pound of copper. These costs are beyond the control of the company. Similarly, wage rates are beyond our control and are now unrelated to the price of copper. The average quantity of copper recovered during 1943 from one ton of ore amounted to 16.8 lb. As there is left from 11.7c. only 6c. per pound of copper after deducting the freight on the ore and the freight and marketing expense of the concentrate, the value remaining to take care of operating expenses amounts to only $1 per ton of ore. Mining at the rate of 120,000 tons of ore monthly means that in order to keep our expenses within the value of the product the expenses must be reduced by 75c. per ton, or about $90,000 monthly. It will therefore be obvious to anyone that continued operation after Jan. 31, 1944, cannot be carried on without eliminating all expense not absolutely necessary. As prices for materials and supplies are unusually high and as wages are fixed by the government, reductions in expense can be brought about only by reduction in staff and operating crews. There is no alternative available to us. A careful review of the present situation indicates that suspension of underground development work, and in fact all work not absolutely required to maintain shipments, can effect the reduction in costs necessary to keep our expenses within ur income. Fortunately, the company has substantial stocks of materials, supplies, and broken ore to enable it to continue shipments for many months to come, during which period the management believes there will be a definite improvement in the manpower situation, thereby permitting the company to resume once again full-scale operations under something approaching normal conditions."

MEXICO

Government to supply hoarders with gold—Dos Carlos still in trouble—Floods in Chihuahua

► The advent of 1944 found mining in Mexico in generally good condition, with production at a high level and exports soaring, though there are reports that shipments abroad of lead, copper, and zinc have fallen off of late and the market for mercury is not as good as it was. Labor trouble is practically negligible, and the transportation situation, particularly rail, continues below par, but indications are that the National Railways, Mexico's largest railroad, will soon be able to relieve this condition with the receipt from the United States of more rolling stock.

► The Rotary Club of Lagos de Moreno, Jalisco, has informed the state government of the discovery of an important tin deposit in a zone that had been little explored, from a mining standpoint, near that town. The Club asked the government to arrange for some company to exploit the deposit, saying that the town has excellent facilities for that operation in the way of abundant labor, water, transportation, and good climate.

► Eduardo Suarez, Minister of Finance, announced recently that the Bank of Mexico will, to the mint's fullest capacity, provide gold pieces for those of the public who prefer to keep their savings in yellow metal. The Minister did not say whether or not these gold pieces will be money, so it is understood that they will be a sort of token, as Mexico has been off the gold standard since 1931 and gold money is officially regarded as merchandise, being bought and sold at a premium of about 4½ silver pesos to one peso of the yellow money.

► Two mining companies, Kildun, operating in San Luis Potosi, and the Cia. Minera de Teojomulco, working in Oaxaca, flatly told the Labor Ministry that they cannot obey the law, based upon a presidential decree that went into effect last Oct. 1, making obligatory the raising by 50 down to 5 percent the pay of everybody in Mexico who earned up to 10 pesos ($2.10) a day. Kildun explained that it cannot grant this raise because it operated at a loss in 1943. Teojomulco said that it cannot obey this law, as its economic condition is so bad that it frequently is obliged to make part of its weekly pay-off to employees in corn and beans. The ministry is investigating both pleas.

► The federal Board of Conciliation and Arbitration is investigating the complaint by more than 200 employees of Mill Tex Mining, John G. Hunt, manager, operating in Durango, that the company suspended work without authorization and owes them

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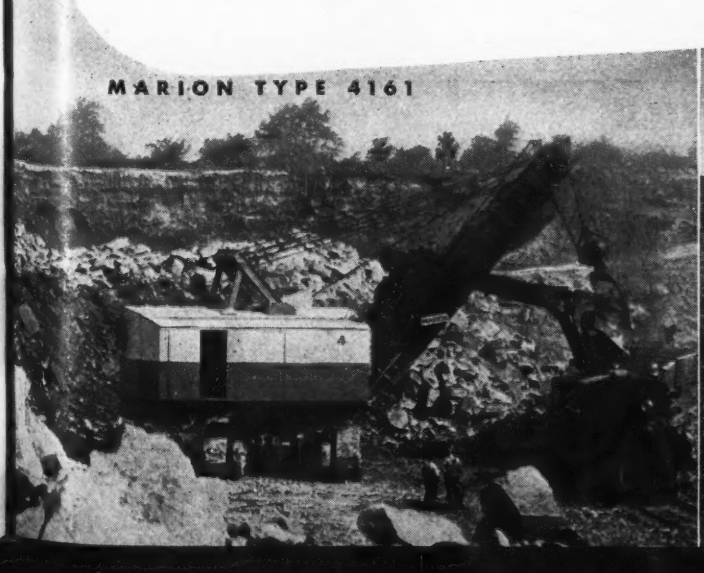

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Mexico *(continued)*

four months wages. The complaint added that Hunt has gone to the United States and that some Durango City banks have embargoed the company's machinery and some other of its properties because of debts.

▶ Four important Chihuahua mining municipalities, San Francisco del Oro, Hidalgo del Parral, Santa Barbara, and Camargo, are to have more water with the investment of 5 million pesos ($1,150,000) by the state and federal governments in those works in 1944.

▶ The Dos Carlos mining cooperatives society, Pachuca, Hidalgo, the pioneer business of this kind in Mexico, as it was organized by the Cardenas government in 1937 with the taking over of the properties of the British-owned Cia. Minera Dos Carlos, S. A., which has found the work unprofitable, is in trouble again. It is reported that the society's executive committee has decided to make some radical changes because of the organization's precarious economic condition. These changes, it is said, include: the laying off of more than 700 members; suspension of working La Blanca mine; generally reducing the pay of those members who earn more than the average; and limiting privileges enjoyed by founder members.

▶ Section 14 of the national miners union has told the Labor Ministry that the Cia. Minera de Rosita, S. A., Nueva Rosita, Coahuila, is not obeying the pay increase law that went into effect last Oct. 1.

▶ Manganese production in Baja California is reported in mining circles to have increased to such an extent that the territory's output of that mineral is expected soon to be averaging 3,500 metric tons a month. Exports of ore and concentrates are on the increase and of late a considerable shipment abroad of pig copper has been noted.

▶ Batopilas, important Chihuahua mining center, was 70 percent destroyed by flooding when the rain-swelled river overflowed. Mining was crippled in the region.

▶ Minas de Oropeo, S. A., has been organized by H. F. Kicklighter, who continues as president, to work reportedly rich copper properties in several parts of Michoacan. The company plans to establish a 200-ton milling plant at its richest property. Lionel Brooks has been engaged as general manager and technical director of the new company.

· CHILE

Cerro Negro copper ready to begin production—Manganese mining stops—Steel works planned

▶ Cia. Minera Cerro Negro's 400-ton copper mill, as well as its 3-km. ropeway, are nearing completion. The camps for housing employees at mine and mill have been finished, and stripping at the mine pro-

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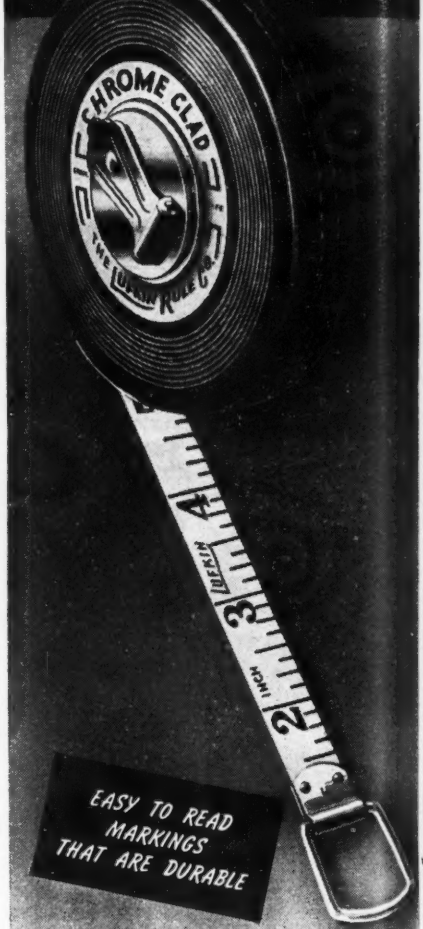

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Chile *(continued)*

gresses satisfactorily. It is hoped that the mill will be ready to operate late in February, or early in March, if the long 44,000-v. transmission line can be finished by then. Owing to the war, all of the equipment installed is second-hand, reconditioned in the country, except the scrapers for the mine and the electrical transformers.

► Manganese mining had to come to a standstill when the 80,000 long tons of ore contracted for with Metals Reserve Co. last February was delivered by mid-December, months ahead of the date fixed in the contract. In less than two years, Chile has produced more than 200,000 long tons of good manganese ore, a feat which nobody thought the mines capable of accomplishing in so short a time; but the stimulus given to this class of mining by the war, plus the financial aid extended by the Corporación de Fomento de la Producción and the Caja de Crédito Minero, combined to make a success of the job.

As most of the mines were caught with fairly large tonnages of ore blocked out and ready for stoping when they were compelled to stop production, discussions are going on between the United States and the Chilean governments to contract for another 40,000 tons of manganese ore to enable the mines to stope this ore before shutting down for good. The mining of this extra tonnage will also allow time for the Ministry of Labor to find other work for about 1,500 to 2,000 miners who will lose their jobs when manganese mining stops completely.

► Not much hope is entertained in Chile that the country's manganese ores will be able to compete with those of Russia, Cuba, India, Africa, or Brazil under peacetime prices and conditions for reasons which have already been given to readers of *Engineering and Mining Journal* (Oct. 1941). The only hope for a permanent survival of Chilean manganese mining lies in the production of ferromanganese to supply the country's needs once the steel industry is further developed as indicated in the following paragraph.

► After the visit paid to this country by a group of American engineers to study the project for establishing a new iron and steel industry at Concepción, it has been decided to erect at this southern town a complete iron and steel works comprising the necessary furnaces and rolling mills. This project will demand the expenditure of $8,000,000 for machinery in the United States; will require three years to complete; will give employment to about 1,000 men; and will produce 100,000 tons of steel a year in the form of round bars for internal consumption. This will be about two-thirds of Chile's present needs.

► The Corporación de Fomento de la Producción has decided to spend about $2,000,000 in prospecting and drilling for oil in the Magellan province, which, according to most geologists, is the most favorable terrain in Chile in which to look for oil. The drilling equipment will be bought in the United States and the geological work is being carried out by the United Geophysical Co.

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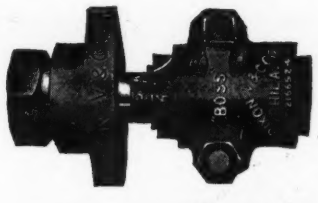

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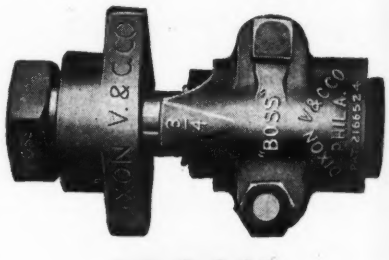

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This Walworth lubricated plug valve meets a wide range of requirements, and also helps to conserve critical copper. Made of close-grained, high strength cast iron, it uses insoluble lubricants to assure tight-sealing, easy operation, and resistance to corrosion and wear.

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Walworth Lubricated Plug Valves are particularly adaptable for the handling of gritty solutions and many other destructive erosive and corrosive industrial and chemical solutions. They are made in sizes from 1″ to 4″. Write for circular No. 91.

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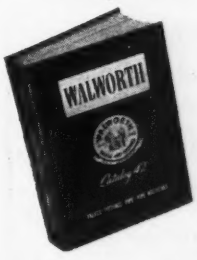

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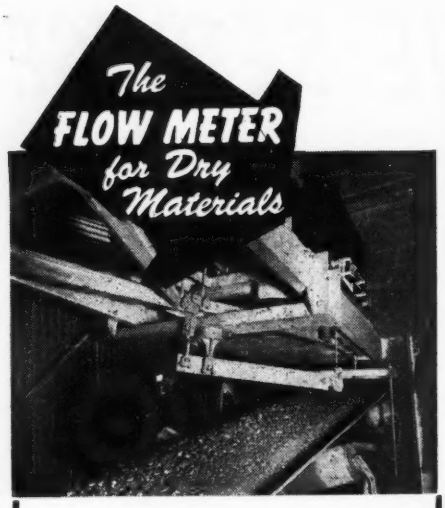

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Write to Builders-Providence, Inc. (division of Builders Iron Foundry), 9 Codding St., Providence 1, R. I., for Bulletin 322.

Sincerely Yours,

BUILDERS-PROVIDENCE

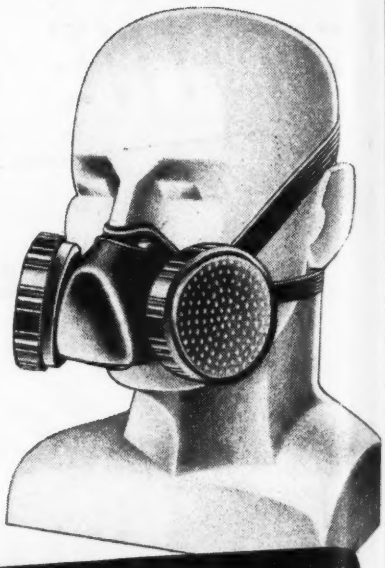
AUSTRALIA

Wiluna develops new property—A resoiling dredge in Victoria—New Zealand mine output increases

▶ A property of future interest in the Kalgoorlie field is that of Mt. Charlotte (Kalgoorlie) Gold Mines, Ltd., situated at the eastern end of the main portion of the city. An option over the leases is held by Wiluna Gold Mines, Ltd., but owing to existing labor conditions, this company has been able to do little in the way of exploration and development since the option was acquired in Dec., 1941. The cash price on exercise of the option is £A220,000, and the minimum expenditure on preliminary investigation is £A24,000. In the early years of the gold field former owners of the leases recovered 87,694 oz. of gold from 367,521 tons of ore mainly extracted from open-cut workings and shallow levels. The Mt. Charlotte company drilled 25 boreholes, totalling 13,618 ft., over a strike length of 1,440 ft. Boring was carried to a depth of 1,000 ft. from surface and disclosed ore in the northern section estimated at 1,122,200 tons having a grade of 5.36 dwt. per ton, including 501,500 tons assaying 5.9 dwt. per ton, over an average width of 61 ft. and to a depth of 750 ft. Drilling in the central and southern sections of the property also indicated other extensive orebodies. The property is attractive to Wiluna Gold Mines, for if future development confirms the drilling results it will permit the removal of the company's mining and treatment plant from the Wiluna property, which is nearing exhaustion of its payable ore, to another large-scale ore deposit.

VICTORIA

▶ Resoiling of worked ground is a feature of modern dredging operations in Australia and a successful example of this work is presented by Victoria Gold Dredging Co., N. L., which is working along the Loddon River flats that are good pastoral land. In addition to restoring this land to its original condition, the company must avoid polluting the river, so that extensive settling areas must be provided before any water can enter the stream: further, the company must not work the actual banks of the stream. The dredge is equipped with 9½-cu.ft. buckets and can dig 27½ ft. below water level. Special resoiling features are the arrangement of the hoist and bow gantry to permit the buckets to cut ground 10 ft. above water level. Overburden is taken from behind the ladder well by a belt conveyor and up a stacker boom extending 104 ft. astern. While dredging overburden, a cast manganese steel trap door in the middle of the hopper bypasses material to the conveyor instead of to the trommel. A sliding cut-off gate is also used to seal the trommel entrance, and steel doors hinged to the sides of the well prevent the save-all being blocked by spill. In working, overburden is stripped to about



The man with the one-way nose

■ **Here's Oscar, a valued member of the Willson research staff who has a prized peculiarity: he can inhale without exhaling, or vice versa.**

Always breathing in one direction, he comes in mighty handy when respirators are to be tested. Put one on him and he'll inhale tainted air as long as his colleagues wish, while they measure and record the respirator's performance. And this is, of course, only one of countless ways by which Willson tests its products.

***All* Willson protection is scientifically engineered to yield the utmost in safety and comfort. That is why so many Safety Directors and Purchasing Agents specify Willson for head, eye and lung protective equipment. For 73 years Willson has been a leader in the field of accident prevention.**

Willson No. 780 Approved Respirator
This respirator is Bureau of Mines-approved for protection against metal fumes, toxic dusts and chromic acid mists. It can be worn comfortably under welding helmets, if necessary.

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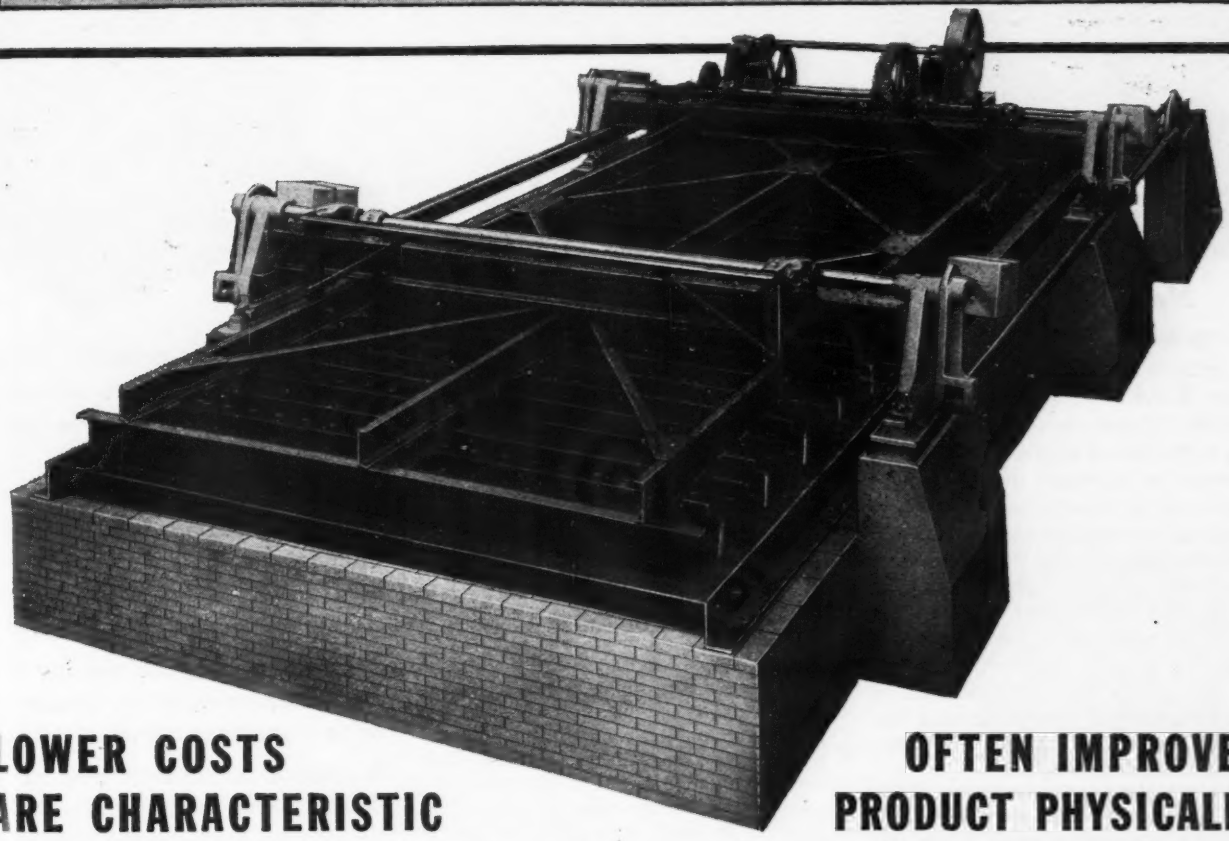

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That this machine is able to handle successfully many materials where other types of dryers fail is largely due to its unique rabbling mechanism which distinguishes it from all other dryers. If the Lowden Dryer is not adaptable to your product, we will be the first to tell you so. When writing please state your problem.

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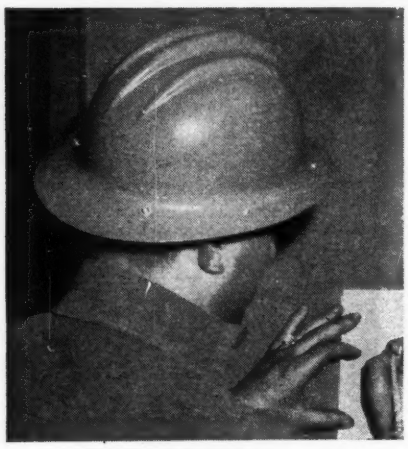
What's New IN SAFETY

NEWS ABOUT SAFETY EQUIPMENT AND METHODS



New Hard Hat

—greater comfort, safety

An entirely new Hard Boiled Hat, known as the "Airlined" model, is now available. Weight has been reduced to little more than 12 ounces, while impact resistance is increased through a new crown molding development.

Streamlined corrugations molded into the crown furnish the added strength, and at the same time give this hat an entirely new styling that has made an instant hit wherever it has been introduced. Exhaustive drop-testing proves this new crown the most resilient and impact-resisting of all Hard Boiled Hat models. It may dent under heavy impact, but will not shatter.

Greatest step in development, however, is the new six-point, adjustable hammock suspension, with adjustable size sweatband. It is now necessary to stock but one size hat to fit all head sizes, either men or women. Ordering and issuing of protective hats is simplified for both safety and purchasing departments.

Complete comfort is a result of a full-floating, self-shaping sweatband and hammock. No rigid parts of the hat come in contact with the head, so it is built truly on the floating suspension principle. An air space is always left between the hammock and the crown for ventilation, which makes this hat literally the "Airlined" model. 3-2-44

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EVERYTHING BULLARD IN SAFETY

Australia *(continued)*

20 ft. ahead of the gravel face; the overburden is transported astern and dropped on the surface of previously placed tailings from the dredging of the auriferous gravel. Screen oversize is discharged over the stern by a stone chute, and screen undersize, after passing through the treatment plant, is washed over sluices extending further astern.

The procedure gives three layers of material: coarse-screen oversize resting on the bottom; sandy-screen undersize covering the oversize; soil and clay overburden forming the new surface. Separate dredging of soil and overburden reduces the amount of slime formed, enables trommel and large pumping sets to be closed down during stripping, and allows efficient bucket filling. About 24 percent of dredging delays occur in changing over from one operation to the other.

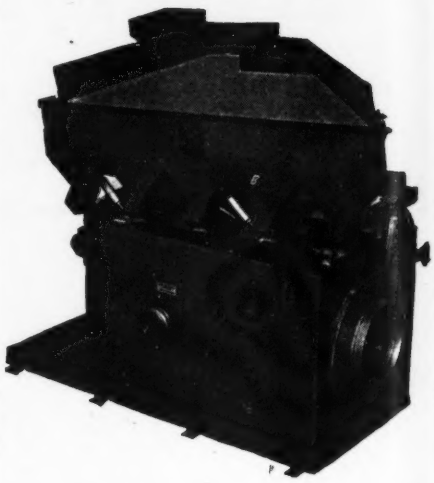
Care is taken to avoid leaving large humps or depressions in placing the material. Subsequent leveling is necessary, but before commencing this, the ground is allowed to dry and consolidate. It is then leveled with tractors and horse-drawn scoops and finally ploughed and cultivated. It is then sown with oats and superphosphate and after harvesting is again cultivated and sown with permanent grass. The average cost of reclamation is about £71 (Aust.) per acre, equivalent to 0.42 d. per cubic yard dredged.

NEW ZEALAND

▶ Statistics for 1942 released by the Department of Mines show that production of gold and silver is still withheld from publication under wartime regulations. Output of other minerals showed an increase compared with figures with the previous year. Coal production established a record for the Dominion and most other minerals recorded increased figures, the most notable being serpentine, which is being used in place of phosphate rock in fertilizers and is meeting a rapidly expanding demand. Mining generally experienced numerous difficulties, common to the industry in other countries, due to prevailing conditions, the principal of which arose from shortages of manpower and supplies.

Labor employed in all branches of mining amounted to 8,463 men, compared with 9,557 men in the previous year, a decrease of 11½ percent. Of the total, 59 percent was employed in coal mining. Coal is well distributed throughout the country and bituminous, subbituminous coal, brown coal, and lignite are produced both by companies and by a large number of small operators. Mercury mining made some advance, but operations at the principal deposit were retarded by a serious landslide that covered the working faces. Asbestos mining during the period involved considerable preparatory work, the benefit of which will become apparent during the crurent year. An increased tonnage of bentonite was raised and there are good prospects of export trade after the war. In gold mining, the chief producers were the Martha Gold Mines (Waihi), Ltd., and Blackwater Mines, Ltd. Dredges totaled 21, including three new plants.

Air Tables for Dry Classification



Grading of dry metallic or non-metallic materials into sizes may now be done without the use of screens.

For example, the removal of minus 100 mesh material from coarser fractions can be economically handled on air tables with no screen cloth to be replaced.

Conversely, they are equally effective in removing a few coarse particles from finer grinds.

A capital installation cost of less than $2000 will handle 10,000 pounds an hour for the removal of minus 100 mesh.

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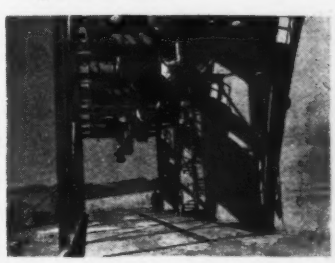
The Gabbs Valley Project is a 2000 ton concentration and calcining plant to supply magnesia to Basic Magnesium, Inc., for the production of this vital new metal.

Southwestern was chosen to engineer and design this entire project and to supervise construction. An adequate water supply had to be developed, housing facilities provided for workers, administration buildings, shops, stores and roads constructed, besides the buildings and facilities for ore treatment.

For more than 25 years Southwestern has successfully engineered and constructed ore treatment plants of every description. Their services are available to you on any phase of ore treatment.

Roasters 7 stories high use 500,000 gallons of fuel monthly "cooking" magnesium oxide.



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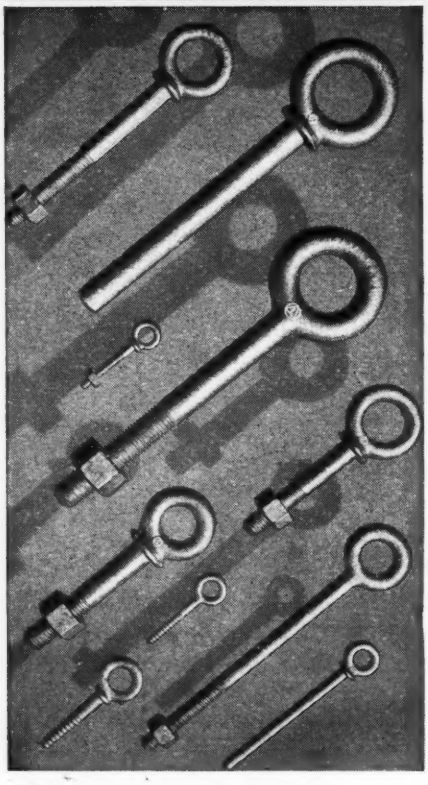

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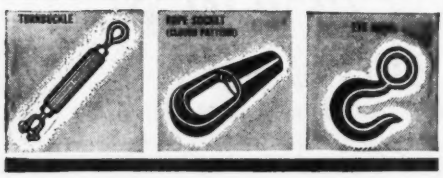

AFRICA

Miners ask wage increase—New high in diamond sales—Nigeria tin output at maximum

▶ White miners employed by the Witwatersrand gold mines are asking for a 30 percent advance in wages. Negotiations are being carried on between the miners and the Transvaal Chamber of Mines in what appears to be an unusually friendly spirit. The miners evidently appreciate the difficulty of the employers' position, due to greatly increased taxation and the much higher cost and inadequate supply of essential working materials. It is likely that a compromise will soon be reached. At the same time the miners employed in No. 15 shaft at Crown Mines went on a strike because of an unsettled dispute of three years standing. This strike lasted only two days. Though there was no unrest at the other shafts of Crown Mines, it was for a time feared that the strike might be followed by sympathetic strikes.

▶ Dividend action has now been taken by 44 Witwatersrand companies, for the half year ended with December, and the amounts to be paid are reduced slightly by 32 of them, four of those which paid small dividends last year having decided to pay nothing. Grootvlei, a new-comer which started production at the outbreak of war, increased its payments with 5s. 6d., against 5s. in 1942; and Vlakfontein has paid a maiden dividend of 3d. The four which are passing their dividends are Geldenhuis Deep, Langlaate, Van Ryn Deep, and Van Ryn Gold.

▶ There were unusually wide variations in the production and profits of Witwatersrand mining companies in November. For instance, Geduld's profit was down by some £5,000 at £110,223 and East Geduld's up by an almost similar amount at £267,680. Grootvlei's profit was down £4,000. These unusual variations probably reflect the difficulty experienced in obtaining necessary supplies and spare parts for broken equipment.

▶ New Union Goldfields has obtained the consent of the South African Treasury to a proposed increase of capital and the issue of 1,280,000 new shares at 5s. each at a price of 7s. 6d. The object apparently is to carry out a plan to acquire claims which contain the downward extension of the Main Reef below Crown Mines and other Witwatersrand producers. To this end it recently formed the Rand Ultra Deep company in association with Rooderand Main Reef Mines. It is also announced that Johannesburg Consolidated has agreed to join with New Union Goldfields and Rooderand in prospecting certain areas in the Orange Free State.

▶ Diamond sales the past year came to £20,000,000, which is a new high record, or the highest since a decade ago. It compares with £10,500,000 in 1942. Sales of industrial diamonds last year are variously estimated from £6,000,000 up. Producers

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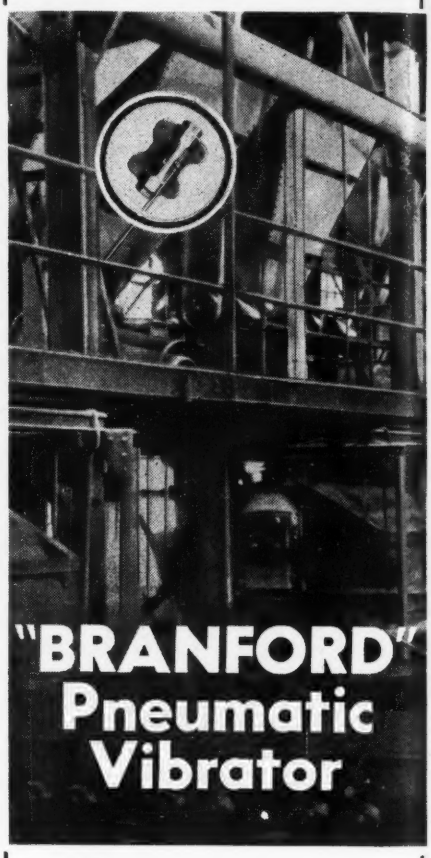

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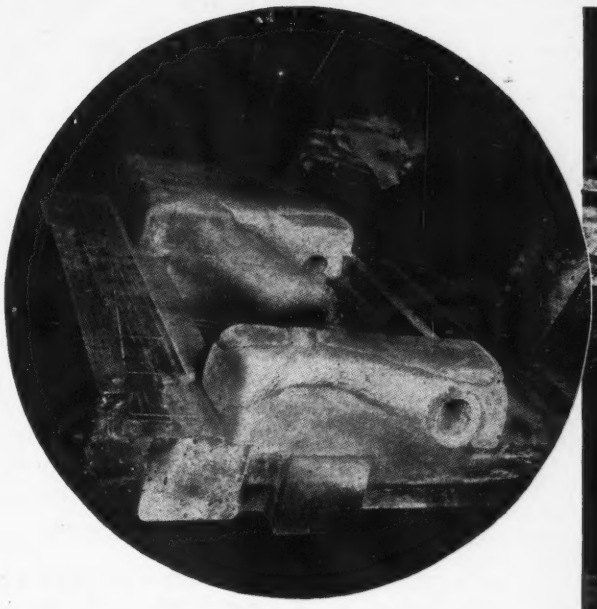
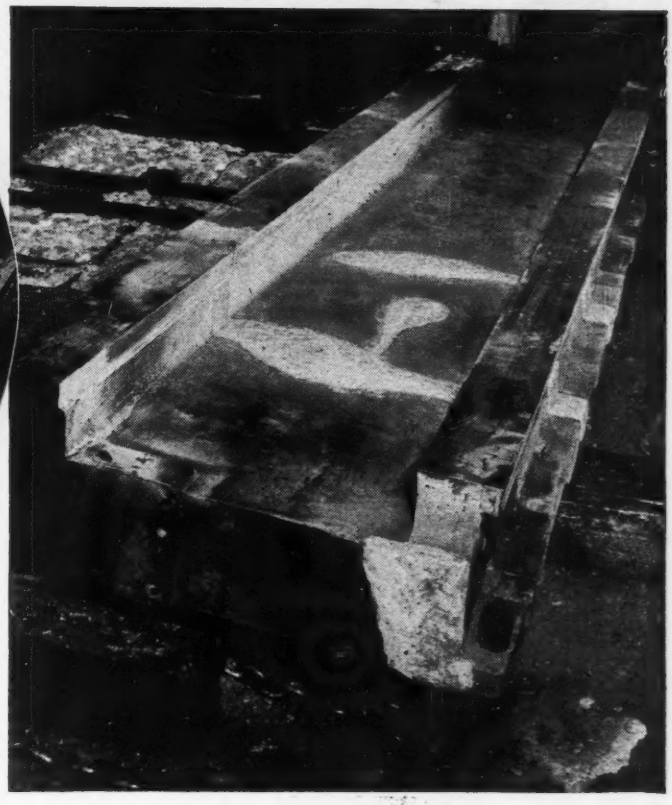
Chalk up *ANOTHER PRODUCTION VICTORY* for Bronze Repair Welding



Above: 3,000-pound saddle of milling machine reclaimed by Bronze Welding.



Right: Severed ribs in this base were welded as well as part of the bed.

A MILLING MACHINE was being moved to an important new war production job when the chain supporting it broke. Crashing to the floor, the machine was badly damaged. A long, costly production delay threatened until a new one could be obtained.

Then bronze welding came into the picture. Using this time-proved repair process, both the 15-ft. long base, weighing approximately 19,000 pounds, and the 3,000-pound saddle were quickly repaired by the Super Arc Welding Company, Detroit, Mich. 850 pounds of 3/8" Tobin Bronze* Welding Rod put the machine back on the job in a week.

For speedy repair welding of cast iron, steel, malleable iron and copper, don't overlook the advantages of such rods as Tobin Bronze and Anaconda 997 Low Fuming. Complete information on these and other Anaconda Welding Rods is contained in Publication B-13. Copy on request. 4377

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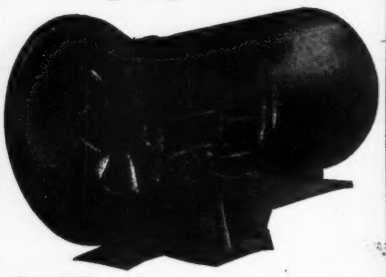

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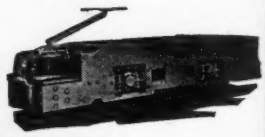
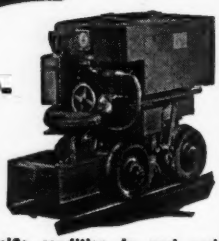
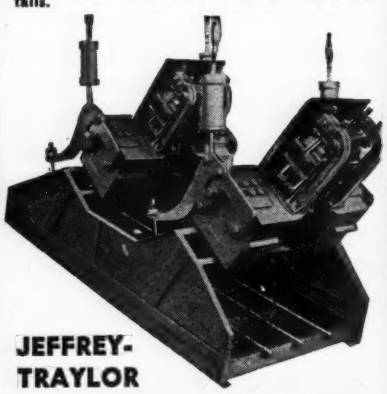


MINE LOCOMOTIVES



From heavy duty main line haulage to small trammers, Jeffrey has a type, size and track gauge to meet your specific condition in coal and metal mining. Trolley, cable reel, storage battery and combination trolley and storage battery units are available. Catalog No. 555 gives complete details.



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Africa *(continued)*

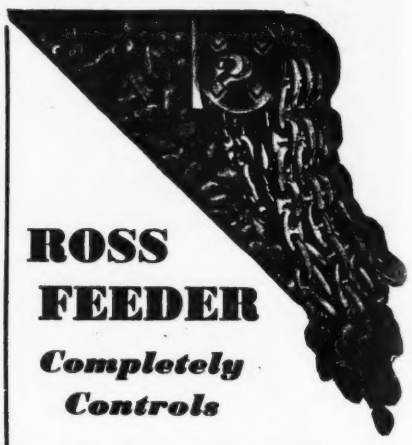
seem able to continue supplying the demand for industrial diamonds. An effort will be made to supply the demand for gem stones also. DeBeers will put on a double shift at the Dutoitspan mine immediately, though operation at this mine was not resumed till last September. It will also reopen the Kleinzee mine. DeBeers has declared a dividend of £1 per share, making 70 percent for 1943 against 40 percent in 1942. Consolidated Diamond Mines of Southwest Africa is paying a total of 45 percent, against 15 percent the year previous.

▶ Rhokana Corp. has declared a final dividend of 15 percent, making 25 percent paid for the year on its £2,500,000 of ordinary and "A" shares. This compares with 15 percent paid the previous year. Although under its contract to supply its production to the British government it is getting about the equivalent of 8c per pound for its copper, the company seems to be doing very well. The other Northern Rhodesia producers, Roan Antelope and Mufulira Copper, receive the same price as Rhokana for their copper. Practically no (see page 116) information is released concerning their production, but it is evident that all three have expanded considerably, as the Wankie Colliery Co., whose output is sold chiefly to the copper mines and the railways carrying supplies and production, sold some 18 percent more coal last year than the year before. The ability of the Northern Rhodesia copper companies to distribute dividends while selling their copper at such a low price and paying prodigiously high war taxes indicates that their cost of production must be extremely low.

▶ Tin production in Nigeria is being forced up to the highest possible limit. Two companies have recently issued reports for the year to March 31, 1943, and it is understood that there has been further expansion since that date. Sales of ore by Amalgamated Tin Mines of Nigeria were £1,517,726, against £1,263,846 in the preceding year. Dividends of 15 percent were paid. After all charges, dividends, and deductions, the carry-forward was increased by £2,365. Amalgamated Tin has purchased the entire capital of Keffi Tin, a company owning 9,000 acres of adjacent property. Naraguta Tin's profit for the year was £32,887 and dividends totaling 8 percent were paid.

▶ Mawchi Mines, whose property in Burma is now in enemy hands, realized a gross profit of £200,777 on the sale of its stock of concentrates during the year ended March 31. It ended the year with cash resources of £429,196, which it decided to carry forward. With other Burma mining companies, it is endeavoring to arrange to receive from the government compensation for whatever damage it has sustained from enemy action. Mawchi plans to resume operations as quickly as possible after regaining possession of its property.

▶ Three Malayan tin mining companies whose properties were seized by the Japanese in December, 1941, have recovered from the government £312,547 of previously paid tax money.



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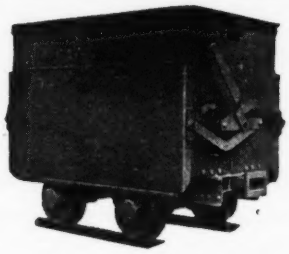

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The ability of high manganese steels to workharden serves industry in important and varied applications. Manganese steel castings are used for railway frogs and crossings, rock-crusher parts, steam-shovel dipper teeth, dredge-bucket lips, centrifugal pump parts for gravel dredges. The chief application of rolled manganese steel is in rails used for special service, and for light forgings subjected to heavy wear.

Besides manganese, we produce other ferro-alloys and metals . . . such as chromium, silicon, vanadium, tungsten, columbium, boron, calcium, and zirconium . . . used in alloy-steel making. We do not make alloy steels, but we have over 35 years of experience with their development and use. If you have a problem in the selection or application of an alloy steel, call on us.

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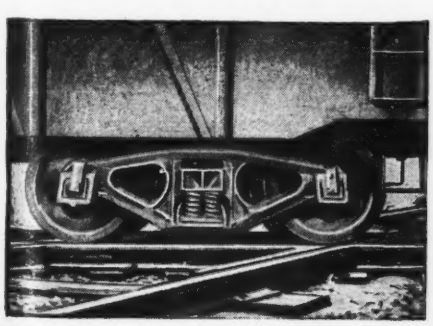
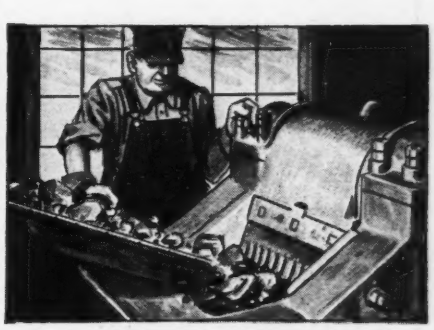
Bulldozers **used in road construction utilize the strength and wear-resistance of manganese steels in the blade, in axle and spline shafts, steering arms, drive pinions, structural parts, gears, and treads.**



Railway crossings, **frogs, and rails are made of high manganese steels to withstand the wear and the weight of heavily loaded trains that can not be delayed for road repairs.**

Dipper bucket teeth **are cast of Hadfield steel that increases in hardness and life-length under abrasive wear from gravel and rock in construction work.**



Jaw crushers **used in breaking up rock have wearing parts made of Hadfield steel because the steel gains longer life from cold working under heavy pressure and severe abrasion.**

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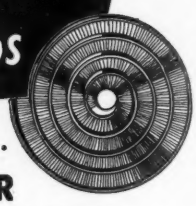

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Denver Meeting

(*Continued from page 120*)

perity of all sections of the country and of all its major industries, and that national prosperity could not be obtained without employing approximately 11,000,000 people in seventeen Western states whose economy depended heavily on raw-material production. He called attention to the impossibility of competing with foreign industries having vastly lower living and wage levels. The West, he said, produces half of the nation's mineral wealth.

Reciprocal Trade Hit

Dr. Coulter stated that the reciprocal trade program has produced no benefits to the domestic economy and accused the State Department of sacrificing American interests for increased volume of foreign trade. Mere volume, he said, was an inadequate criterion as to the importance of the trade. He said that the United States was one of the four leading international traders and has the largest amount of duty-free imports of any country. Our tariff rates, he insisted, were lower than the average in leading nations and about equal to the world average.

Merrill E. Shoup, president of the Golden Cycle Corp., speaking on the future of gold, complained about the gold-closing order, saying that it would take the gold industry and associated communities many years to recover from its harmful effects.

F. A. Wardlaw, Jr., manager of International Smelting & Refining Co., discussing "Prospects for Western Mining," said that the mining industry would muddle through and meet its problems somehow. He stated that "take-home" wages had increased 61 percent since 1941, with no important increase in gross income to the operators. He advocated postwar stockpiles and either the continuation of premium prices or wage reductions, it being impossible for the mine operators to stay in business otherwise.

F. H. Hayes, chairman of the WPB-OPA premium-quota committee, described the present status of the premium-quota system, stating that there was no present intention of broadly curtailing premiums now in effect.

On the subject of stockpiles, E. H. Snyder, manager of Combined Metals Reduction Co., stressed the vital need for stockpiles to prevent demoralization of the metal mining industry. He was against accumulation from foreign sources in cases where supplies could be had, even at high cost, from domestic sources. Discussing the same subject, Robert M. Searls, San Francisco attorney, was of the opinion that it would be necessary to engage in foreign trade and accept part payment in raw materials, and that to stockpile any such commodities was a logical means of preventing their collapsing the domestic markets. He recommended orderly liquidation of surpluses at such times when demands are strong enough to prevent falling prices.

The meeting closed with reading of the resolutions of the Western Division of the American Mining Congress. These advocated the fullest possible exercise of free private enterprise. In employer-employee relations, collective bargaining and the impartial settlements of disputes were recommended. The resolutions held that the return of invested capital to mine operators should be recognized in cutbacks in war mineral requirements. Opposition was registered to paying higher prices for foreign than for domestic production and to the distribution of imports prior to full utilization of domestic production. Stockpiles as an economic and national security measure were advocated, the same to take in all types of mineral material, including scrap. A permanent national reserve was recommended, with accumulation to include reverse lend-lease shipments and foreign purchases. The resolutions sought preference for domestic producers and release of stockpiles only by act of Congress.

The tariff clause favored maximum international trade, but not at the expense of national security. It held for protection of domestic mines adequate to compensate for lower-grade ores and higher costs.

The resolution on public land policy opposed expansion of the federal leasing system, federal recording of location notices, and proof of annual labor. The present restraints on the granting of patents were also opposed.

Rescindment of the gold-mine closing order was advocated at the earliest possible date; also legislation to freeze the contractual obligations of closed gold mines. In regard to monetary policy a currency based on gold and silver was recommended, and the restoration of free circulation of gold.

The Social Security resolution commended Congress for freezing taxation "at present adequate rates" and approved merit rating systems in state unemployment compensation insurance laws.

Stern prevention of government extravagance was advocated, and budgetary control of appropriations to keep them in line with revenues. Taxation was recommended based on recognition of the necessity of preserving incentives to encourage investment of private capital. Allowance to prevent the taxation of reserves accumulated through deferment of development was sought; also liberalization of depreciation allowances to permit recovery of invested capital in all cases, and simplification of the tax statutes.

Wants West-South Bloc

Speaking at the "Sowbelly Dinner," Governor John Vivian advocated the complete restoration of States' rights after the war and the open defiance of the gold-mine closing order, if the same is not rescinded at an early date. The Governor proposed the formation of a West-South bloc to prevent domination of the country by Eastern influences. Senator "Happy" Chandler, of Kentucky, also spoke in favor of a West-South coalition and the building of regional self-sufficiency. He urged that the United States should retain possession of enemy mandated territory and of mandates of allied countries which the latter were unable to defend. Chandler also advocated that the United States should retain rights to air bases built in foreign territory for war purposes.

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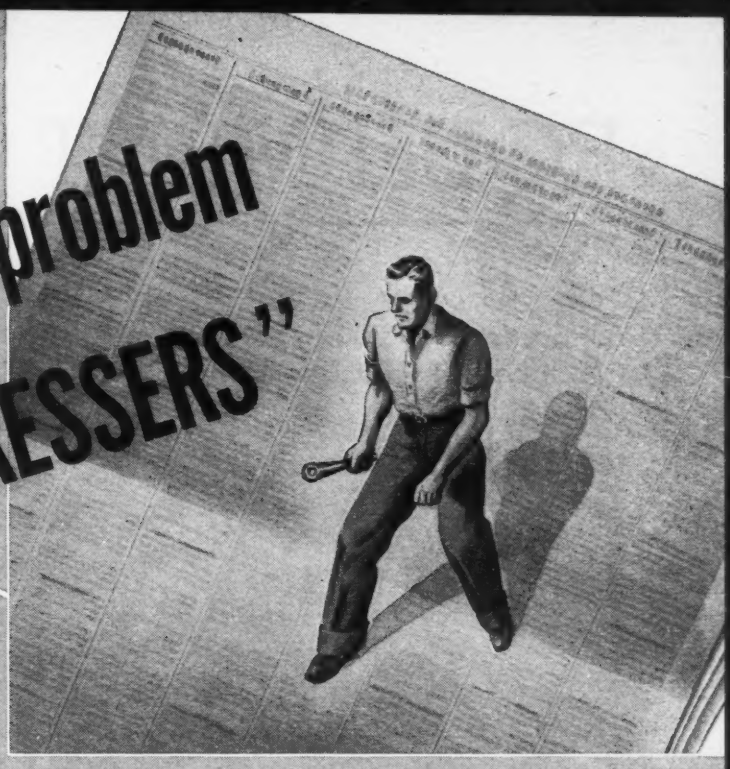

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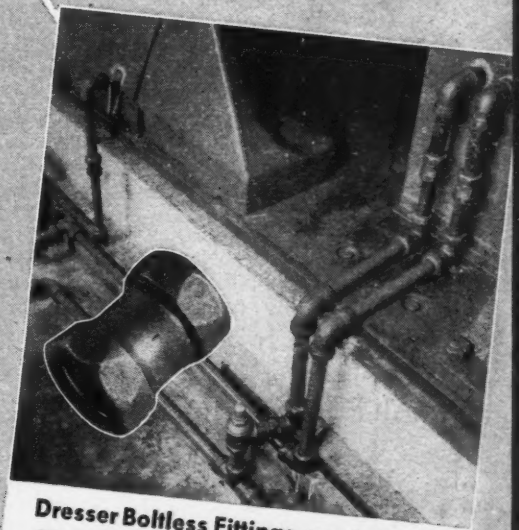

Dresser Boltless Fittings, used above, on engine connections, come completely assembled. To install, slip over plain pipe-ends and tighten end nuts. Sizes, 3/8"—2" inclusive.

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EQUIPMENT NEWS

Bulldozer and Shovel Combined in One Unit

A new two-in-one dirt-moving unit, the Dozershovel, has recently been announced by Bucyrus-Erie Co., Milwaukee, Wis. Limited numbers of the new unit are available for civilian use under government release, although most of the production is taken by military demands.

Supplied with the unit are a bucket for digging and a blade for bulldozing work that are interchangeable. As a shovel, the unit's hydraulic control provides downward

pressures up to 4,200 lb., which facilitates digging and is an aid in bulldozing as well. Both shovel bucket and dozer blade are equipped with a hook on the upper edge that permits use of the unit as a crane. The change from bucket to dozer is accomplished by removing five pins and replacing them when the shift has been made.

The manufacturer claims the unit provides unobstructed visibility for the operator, a low overhead clearance, and a quick high lift. The accompanying photographs show the Dozershovel in use.

All-Purpose Electrode

A new general-purpose electrode for welding mild steel in all positions with either alternating or direct current has been announced by Lincoln Electric Co., Cleveland, Ohio. Known as "Fleetweld 37," the new electrode was designed as an easy-striking, fast-operating rod for light-gage material. The manufacturer claims that higher than normal welding speeds are obtainable, and that there is no slag interference when welding vertically down. The rod is available in $\frac{1}{8}$, $\frac{5}{32}$, and $\frac{3}{16}$-in. sizes in 14-in. lengths and is packed in 50-lb. cartons.

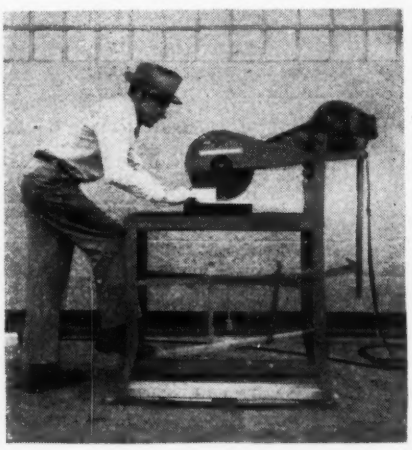
New Magnetic Separator

Designed to operate on the principle of the Ball-Norton underfeed lift method, a new Type "M" magnetic separator is being built by Stearns Magnetic Mfg. Co., Milwaukee, Wis. It can be furnished in various sizes and belt widths to suit the customer's requirements.

In the new separator, the magnetic field is placed above a separating belt that passes over a feeder belt carrying the material to be concentrated. The magnetic portion of this material is lifted to the separating belt, where it is subjected to a violent rolling movement by the alternating polarity characteristic of the magnetic field. The manufacturer reports that this has the effect of cleaning the concentrate by releasing entrained non-magnetic particles, which fall back onto the feeder belt. Because the separating belt runs faster than the feeder belt, the magnetic material is spread over a wider area on the former and the cleaning effect is facilitated.

Masonry Saw

Masonry of all types is said to be easily and accurately cut by a new saw for refractory material recently introduced by Clipper Manufacturing Co., St. Louis, Mo. Of particular interest to the mining industry is the use of these saws in cutting firebrick shapes for furnace linings



and similar uses. Silica brick, mullite, chrome, magnesite, and sillimanite refractories are said by the manufacturer to be easily cut to required shapes and sizes by the machine shown above.

INDUSTRIAL NOTES

Army-Navy "E" awards, or renewals of existing awards, have been given to the following companies: **Ohio Brass Co.**, Mansfield, Ohio; **De Laval Steam Turbine Co.**, Trenton, N. J.; the **Augusta** and the **Barberton plants of Babcock & Wilcox Co.**; and, for the fourth time, to **Continental Gin Co.**, Birmingham, Ala.

Vincent K. Alexander has been appointed sales manager of Manheim Mfg. & Belting Co., Manheim, Pa.

Oliver United Filters, New York, N. Y., announces the death of **Richard Jennings,** field engineer with the company, who suffered a stroke while completing some test work in a paper mill.

H. K. Porter Co., Inc., Pittsburgh, Pa., announces the opening of an enlarged New York and export office at 50 Church St., New York, N. Y., to be directed by **Thomas MacLachlan,** formerly New York manager for Vulcan Iron Works. **R. G. Newell** will direct activities of **Porter's Quimby Pump Division** in New York and New England from the new office.

A 43-minute picture story, called **"War Department Reports,"** dealing with the strength of our enemies and what it will take to crush them, is available for presentation to war workers. Printed in both 16 and 35-mm. sound film, the picture may be obtained through the **Industrial Services Division, War Department, Bureau of Public Relations, Washington, 25, D. C.**

BULLETINS

Belt Conveyor Equipment. Webster Mfg. Co., Tiffin, Ohio, has just issued a 160-page data book on the design and industrial uses of belt conveyors. Charts and tables assist in the selection of suitable conveyor units and equipment for specific service requirements. Basic formulae are given for calculating capacity, power, and belt tension. Care and maintenance of equipment receive special attention, and an index provides ready reference to the contents.

Protective Coatings. Amercoat, a non-corrosive protective paint for metal surfaces that can be applied cold with a spray gun, is described in a new bulletin of American Pipe & Construction Co., Los Angeles, Calif.

Timber Cutting. Convenient methods of sawing timber in confined spaces are described in a bulletin on the Atkins-Hassler electric treefaller, a light, hand-held chain saw produced by E. C. Atkins & Co., Indianapolis, Ind.

Circuit Breaker Selection. Allis-Chalmers Mfg. Co., Milwaukee, Wis., has available for distribution in slide-rule form a simplified means of determining the correct size of air circuit breakers for all industrial applications.

Manganese Steel. American Manganese Steel Division of American Brake Shoe & Foundry Co., Chicago Heights, Ill., has prepared a bulletin describing the uses of manganese steel in the clay-products industry. Similar bulletins have dealt with the mining and the quarrying industries.